Final Report

Hoechst Celanese Chemical Group, Ltd.
Bay City, Texas
MIT/Fall-off Report
Injection Well WDW-110 (Well No. 1A)

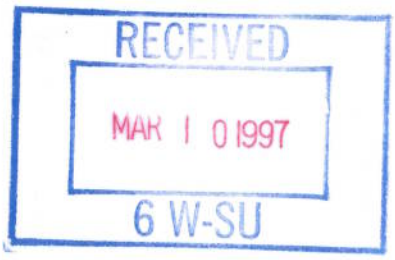
ECO Solutions, Inc.
9800 Richmond Avenue
Suite 320
Houston, Texas 77042
(713) 780-1955
FAX (713) 780-0870

ECO Job No. 96039

February, 1997

ECO SOLUTIONS, INC.

HOECHST CELANESE CHEMICAL GROUP, LTD.
BAY CITY PLANT
BOTTOM HOLE PRESSURE FALLOFF AND MECHANICAL INTEGRITY TESTING FOR INJECTION WELL WDW-110 (WELL NO. 1A)



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1.0 INTRODUCTION

1.0 INTRODUCTION

Hoechst Celanese Chemical Group, Ltd. (HCCG) contracted ECO Solutions, Inc. (ECO) to perform the annual mechanical integrity testing on their Class I nonhazardous injection well, WDW-110 (Well No. 1-A), located at their Bay City facility. A schematic drawing of the well is included as Figure 1. The attached report details the data and test results associated with the mechanical integrity testing.

The following provides an overview of the key elements of the testing on WDW-110 (Well No. 1-A).

- Bottom Hole Pressure falloff (BHP)/Falloff testing was conducted to satisfy the annual ambient monitoring requirements of the US Environmental Protection Agency (EPA) and the Texas Natural Resource Conservation Commission (TNRCC) , Underground Injection Control (UIC) Program.

- An Annulus pressure test (APT) was conducted to satisfy the annual mechanical integrity test (MIT) requirements of the TNRCC.

- A Radioactive tracer (RAT) survey was conducted to satisfy the annual MIT requirements of the TNRCC.

HCCG personnel contacted the TNRCC personnel to inform them of the MIT schedule on WDW-110 and ask whether a field inspector would be present. TNRCC informed HCCG that a field inspector would be present for the MIT field work.

The BHP/falloff test was conducted on Tuesday; January 21, 1997 through Thursday, January 23, 1997 and was witnessed by Mr. Ken Hood of Gulf Coast Well Analysis (GCWA). and supervised by Mr. Wes Smith of ECO

The APT and RAT on WDW-110 (Well No. 1-A) were conducted on Thursday, January 23, 1997, and was witnessed by Mr. Wesley Smith of ECO. Mr. Chuck Green with TNRCC reviewed the APT data and witnessed the RAT.

1.2 EXECUTIVE SUMMARY

Following the successful completion of the MIT conducted on January 23, 1997 on WDW-110, HCCG returned WDW-110 to standby status. A summary of the results of the BHP/falloff survey and MIT are as follows:

Bottom Hole Pressure/Falloff Testing

Waste effluent was injected into WDW-110 at an average rate of 207 gallons per minute (gpm) for 92 hours and then shut-in for a total of 38 hours. The BHP/falloff survey was conducted by GCWA. There is good agreement between the measured data and model response. Superposition and Pressure History Simulation analysis also provide results consistent with the log-log analysis presented herein. A full discussion of the falloff analysis is presented in Section 4.0.

Annulus Pressure Test

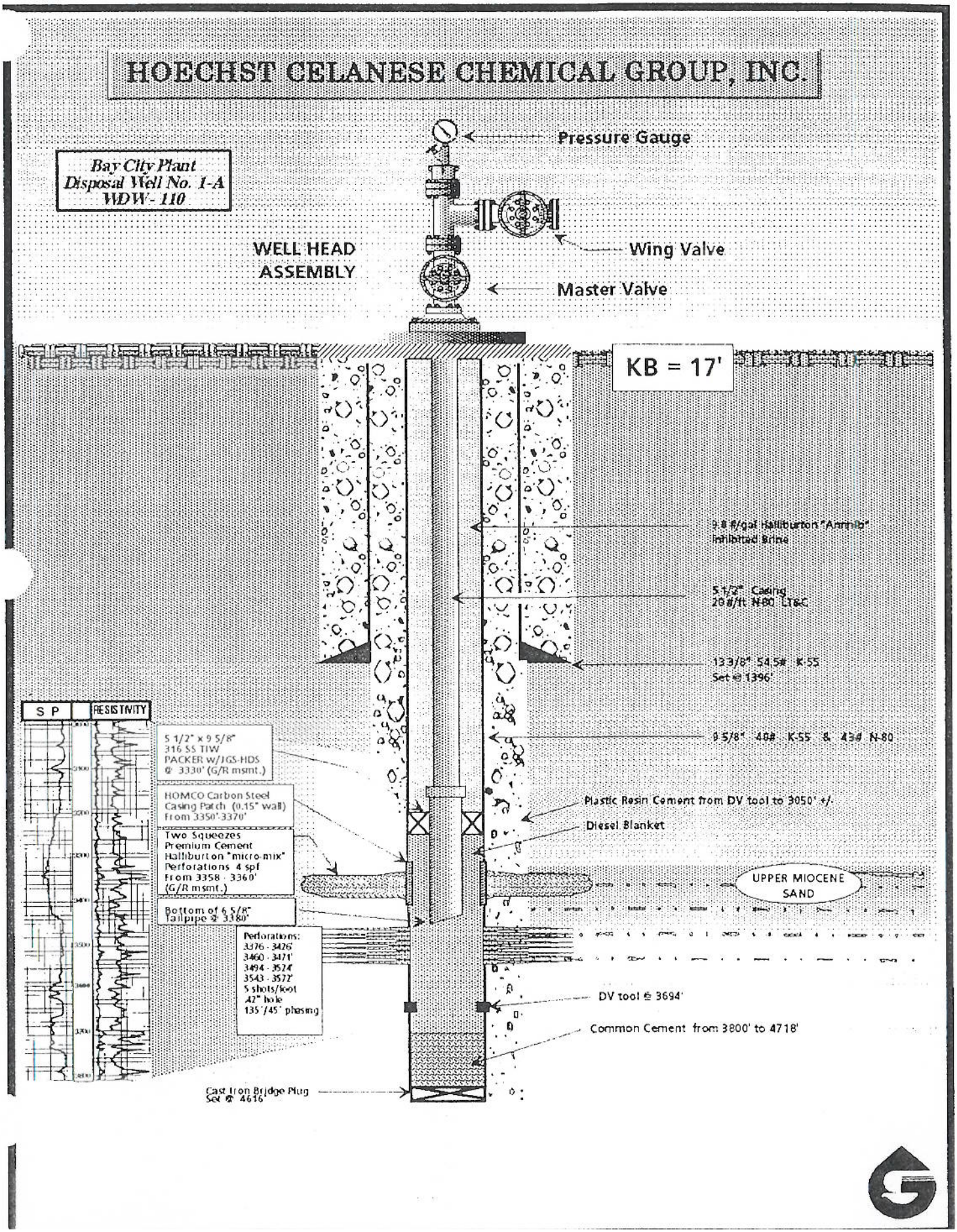
A demonstration of internal mechanical integrity was supported by an APT conducted on January 23, 1997. The annulus was pressurized to a maximum of 1100 pounds per square inch gauge (psig). The APT was monitored for sixty minutes. During the final 30 minutes the pressure loss with HCCG's digital pressure gauge was measured from 1097 to 1094.5 psig, or 2.5 pounds per square inch (psi) (0.23%), which is well within the 5% pressure loss criteria set by the TNRCC. The APT data and plot are included in Appendix A.

Radioactive Tracer Survey

The RAT survey performed on January 23, 1997 demonstrated external mechanical integrity since no upward fluid movement from the injection interval adjacent to the long string casing was occurring. Additionally, this determination can be made as a results of (1) the favorable comparison of the "before" and "after" base gamma ray surveys, (2) the two multiple-pass tracer surveys and (3) the two stationary surveys conducted 20' above the perforated interval. This interpretation was supported by an independent evaluation letter provided by GCWA and is included in Appendix B together with the RAT log.

FINAL COMPLETION

Detailed Upper Hole Section



2.0 FIELD OPERATIONS SUMMARY

2.1 BOTTOM HOLE PRESSURE FALLOFF SURVEY

Thursday, January 2, 1997

Mr. Wes Smith with ECO traveled from Houston to HCCG Bay City Plant and met with Mr. Bryan Barrington. The procedures for conducting the BHP/falloff survey and MIT on WDW-110 and a testing schedule was discussed, written and later circulated to pertinent HCCG personnel. Mr. Smith returned to Houston.

Tuesday, January 21, 1997

At 0630 hours Mr. Wes Smith arrived at HCCG's security office. Mr. Smith was informed of a delay in arrival of the GCWA's equipment and personnel due to a traffic accident in Houston. At 0930 hours met Mr. Ken Hood and personnel (GCWA) and was processed through HCCG's safety orientation. Moved in and rigged up GCWA's wireline unit with BHP/falloff tools including a Panex, Model 1100 digital tool and surface readout (SRO) unit. Note: WDW-110 had been operating at an average injection rate of 207 gpm since January 17, 1997. Also, fluid samples were caught at prescribed intervals to measure viscosity and specific gravity at bottom hole conditions. A lubricator was installed on top the wellhead and the tool ran slowly into the well to a maximum depth of 3300'. NOTE: All depths are referenced to kelly bushing (KB) at 17' above ground level. The tool was allowed to thermally stabilize.

WDW-110 was shut-in at 1400 hours following 92 hour injection period. GCWA's BHP tools monitored the falloff pressure using the SRO recorder.

Wednesday, January 22, 1997

The SRO continued to measure BHP readings until 1930 hours. GCWA downloaded the BHP data. Mr. Smith contacted Mr. Tom Jones (ECO) in Houston and conveyed the results of the BHP data. It was mutually agreed to continue monitoring falloff pressures until 0400 hours on January 23, 1997 for a total falloff period of 38 hours.

Thursday, January 23, 1997

At 0400 hours stopped monitoring BHP/falloff data. Commenced pulling BHP tool out of the borehole to obtain pressure gradient readings at depths of 3,000', 2,000', 1,000', 500' and at the surface. Removed the BHP tool from the well. Conducted APT and RAT survey. Rigged down wireline unit and moved off the location.

2.2 MECHANICAL INTEGRITY TESTING

Thursday, January 23, 1996

At 0730 hours HCCG's personnel commenced preparing to conduct the annulus pressure test (APT). Using nitrogen gas, the annulus was pressured up from 200 to 1105 psig at 0900 hours. The APT was monitored for one hour. Using the HCCG digital pressure gauge and during the final 30 minutes, the pressure loss was measured from 1097 to 1094.5 psig, or 2.5 psi (0.23%). Also, at 0900 hours lowered the RAT tool into WDW-110 and tagged bottom at 3545'. Ran base line gamma ray (GR) log, a short GR repeat section to confirm tool repeatability and two statistical checks at 3310' and 3356'. Ran first multi-pass survey from 2900' to 3460' depicting that all injected fluid was entering the perforated interval . Repeated the multipass survey. Set the RAT tool at 3356' for the first stationary survey, ejected a radioactive (RA) slug and with the GR detectors monitored for 20 minutes with no indicated upward flow. Repeated an identical stationary survey with the same successful results. Ran the after-survey base GR log from 3545' to 2900'. The lower section of the injection interval reflected high GR readings due to a large quantity of RA material remaining from the two stationary surveys. Ran BHP tool to bottom of borehole and dumped the RA material. Pulled the RAT tool out of the hole, rigged down and moved off the location. At 1500 hours returned WDW-110 to HCCG for standby service. Mr. Smith returned to Houston.

3.0 MECHANICAL INTEGRITY TESTING

3.1 ANNULUS PRESSURE TEST

An APT was conducted on Thursday, January 23, 1997 to demonstrate internal mechanical integrity. The APT was witnessed by Mr. Willy Cupples of HCCG, Mr. Ken Hood of GCWA and Mr. Wesley Smith of ECO. The annulus was pressurized to a maximum pressure of 1105 psig. The APT was monitored for sixty (60) minutes using (1) HCCG's certified calibrated pressure gauge and (2) pressure recorder as well as (3) GCWA Panex digital tool and recorder. All calibration certificates for each instrument are included in Appendix C. During the final 30 minutes the pressure loss (HCCG's pressure gauge) was measured from 1097.0 to 1094.5 psig, or 2.5 psi (0.25%), which was well within the 5% pressure loss criteria set by the TNRCC. The APT data and a plot is included in Appendix B.

3.2 RADIOACTIVE TRACER SURVEY

On Thursday, January 23, 1997 a RAT survey was conducted by GCWA to insure that all fluids are entering the injection interval. Analysis of the RAT showed no upward fluid movement. GCWA and ECO personnel conducted the RAT as follows:

1. Ran GR tie-in strip log.
2. Ran initial baseline GR log from 3545' to 2900'.
3. Ran repeat gamma-ray log from 3200' to 2900' to confirm tool repeatability.
4. Ran 5-minute statistical checks at 3310' and 3356'.
5. Made multiple pass survey #1 with a RA slug ejected at 2900' and a pump rate of 50 gpm.
6. Made multiple pass survey #2 with a RA slug ejected at 2900' and a pump rate of 50 gpm.
7. Ran stationary survey #1 at 3356'. Watched RA slug pass tool and monitored for 20 minutes. Pump rate at 200 gpm.
8. Ran stationary survey #2 at 3356'. Watched RA slug pass tool and monitored for 20 minutes. Pump rate at 200 gpm.
9. Ran after-survey base GR log from 3545' to 2900'.

Summary

The results of the radioactive tracer survey conducted on January 23, 1997 were analyzed by ECO and by GCWA personnel. No anomalies were detected on any of the logging runs which would indicate a loss of mechanical integrity. Each part of the log is discussed in detail below.

Profile Survey

Two (2) separate profile runs were made across the packer and perforated interval within WDW-110 (Well # 1-A). Profile run No. 1 and 2 included six and seven separate overlapping passes, respectively, extending from 2900 ± ft. to 3470 ± ft while pumping at 50 gpm. On the profile runs made below the packer, all tracer material moves downward and into the perforations.

Time Drive Survey

Two (2) time drives, or stationary checks, were made on WDW-110 (Well # 1-A). This type of survey is the best indicator to determine whether or not upward fluid movement exists in the well. The flow rate for the time drive portion of the testing was 200 gpm. The two 20 minute checks were each made at 3356', or 20' above the top perforation. No upward movement was observed on any of the time drive surveys. On the first stationary check, a slight increase in radioactivity by one of the two detectors was depicted. The radioactive anomaly was not reflected on the second detector, nor on either of the two detectors during the second stationary check. ECO believes that a small quantity of "131 isotope" was lost from the ejector tool while injecting fresh water into the well at a rate of 200 gpm. The results of the time drive surveys indicate that WDW-110 (Well # 1-A) has mechanical integrity at this time.

Before and After Baseline Gamma Ray Logs

A comparison of the before and after GR logs show residual tracer material in the "after baseline GR log" at the base of the perforated interval resulting from the high volume of RA material ejected during the stationary checks. There was no indication of upward fluid movement.

4.0 BOTTOM HOLE PRESSURE/FALLOFF TEST

4.1 BOTTOM HOLE PRESSURE/FALLOFF ANALYSIS

Purpose Of Test: Required annual Reservoir Evaluation Test for year **1997.** Calculate the following reservoir characteristics: permeability, skin damage, pressure drop due to skin and flow efficiency.

Analysis Description - Fall-Off Test

Method Of Interpretation: The following analysis was performed by utilizing both Semi-Log and Log-Log analysis. **A)** The Semi-Log curve was generated by plotting the standard Horner plot, **Pressure vs $[(t_p+\Delta t)/\Delta t]$**, using an injection time (t_p) of 92 hours. The semi-log straight line was calculated by linear regression through the infinite acting flow period of the curve. The slope **m**, **P_{1hr}**, and **P^*** values were obtained from this curve and utilized for permeability and skin calculations. **B)** The Log-Log curves were generated by plotting **ΔP** and **Pressure derivative** vs the Agarwal Equivalent time function, **$[t_p\ \Delta t/(t_p+\Delta t)]$**. The Log-Log curves were simultaneously positioned over Gringarten type curves until a solution match was obtained. Permeability and skin values were calculated from this match and then compared with those obtained from the Semi-Log analysis.

Semi-Log: The straight line area of the semi-log curve was identified by first using the 1-1/2 log cycle rule to estimate the end of wellbore storage effects. Secondly, the time of the flat portion from the Pressure Derivative curve was used in determining the area of the semi-log curve in which the straight line was drawn. The semi-log straight line yielded a slope value of **5.878 psi/cycle (Horner)** and a P_{1hr} of **1513 psi**. The pressure difference between P_{1hr} and the injection pressure, P_{inj} of **1895** psi compared with the calculated slope would give indications of positive skin damage and relatively high permeability. The beginning of radial flow was observed approximately 4.175 hours into the fall-off test and ended after 18.625 hours.

Conclusions: This particular well was diagnosed to be injecting into a homogeneous reservoir with a calculated permeability of **850 (md)** and skin damage of **+68** utilizing an h_{net} value of **165** feet. The total pressure drop is primarily due to conditions within a small radius from the well.

The following Table is provided to give comparative results with the previous tests and calculations. The primary variables affecting the calculated results are included.

Table 4.1
SUMMARY OF RESULTS

Date MM/YY	Rate gpm	h_{net} ft	μ_w cp	slope psi/cycle	kh/μ	kh md-ft	k md	Skin
01/97	206	165	0.7100	5.878	197535	140229	850	+68
01/96	215	165	0.7100	5.5	217708	154573	937	+57
01/95	192	165	0.7100	4.299	249010	176797	1071	+ 40
02/94	279	165	0.5914	5.308	292995	173277	1050	+ 43
03/93	200	165	0.5560	3.200	348621	193833	1175	+ 29

The calculated results indicate a difference in transmissibility, (kh/μ) of **-9.3%** coupled with a **+19.3%** difference in skin values between 1996 and 1997. In addition, the results calculated from superposition and pressure history simulation analysis provide results consistent with the log-log analysis thus supporting the integrity of the calculated results.

The start time of the infinite acting flow period exceeded the time to exit the waste front, therefore the viscosity of the original reservoir fluid was used for the final analysis.

A homogeneous simulator was utilized to confirm the calculated results mentioned above. The main assumptions were as follows: a single well with infinite acting and radial flow conditions being injected at a constant rate with constant reservoir conditions such as porosity, permeability, and compressibility. Based on this particular reservoir the simulated data matched the actual data with a reasonable degree of accuracy.

The program used for final analysis and well simulation was Trans - II.

Table 4.2
Well Information

Well Type: INJECTION
Perforations: 3376' - 3426' & 3460' - 3471'
Perforations: 3494' - 3524' & 3543' - 3572'
Gauge Depth ..... 3300 feet

[Input Parameters]

Reservoir Pressure	psia	P	1499
Reservoir Temperature	Deg F	T	105
Final Static Pressure	psia	P_{si}	1499
Final Injection Pressure	psia	Pinj	1895
Water Flow Rate	gal/min	qw	207
Sand Thickness	feet	h_{net}	165
Perforated Thickness	feet	h_{perf}	120
Wellbore Radius	feet	r_w	0.3000
Formation Porosity	%	ϕ	33.0
Extrapolated Press @ 1hr	psia	P_{1hr}	1513
Semi-Log Slope	psi/cycle	M	5.878
Production Time	hrs	t_p	92
Shut-in Time	hrs	t_{si}	38

[Fluid Properties]

Fluid Viscosity	cp	μw	7.1000E-01
Formation Volume Factor	RB/STB	βw	1.0058E+00
Fluid Compressibility	1/psi	Cw	3.0345E-06
Total Compressibility	1/psi	Ct	6.0000E-06

Company: HOECHST CELANESE CHEMICAL CO.
Well: WDW 110, Well #1-A
Field: Bay City Facility, TX. Test Date: 01/23/1997

Table 4.3
Calculated Results

[Log-Log Analysis]

Transmissibility	md-ft/cp	kh/u	197535
Flow Capacity	md-ft	kh	140250
Permeability	md	k	850
Skin Damage	total	S	+68
Pressure Drop due to Skin	psi	dP	+402
Drainage Radius	feet	r_d	4895

[Superposition Analysis]

Transmissibility	md-ft/cp	kh/u	197505
Flow Capacity	md-ft	kh	140229
Permeability	md	k	849.87
Skin Damage	total	S	+68.27
Drainage Radius	feet	r_d	4894

4.2 STATIC GRADIENT SURVEY

A static Gradient Survey was run while pulling out of the hole immediately after the end of the BHP/falloff survey. Stops were made at 3300', 3000', 2000', 1000', and 500'. Data collected during the static gradient survey is included in Appendix G and presented graphically in Figure 7. Data collected at each gradient stop were as follows:

Table 4.4
Static Gradient Survey Results

Depth (ft)	Pressure	PSI/ft
0	77.95	
500	301.23	0.449
1000	515.47	0.428
2000	943.07	0.428
3000	1370.59	0.427
3300	1498.97	0.428

APPENDIX A

ANNULUS PRESSURE TEST DATA AND PLOTS

SOLUTIONS, INC.

ANNULUS PRESSURE TEST DATA
HOECHST CELANESE CHEMICAL GROUP, LTD.
Bay City Plant
Waste Disposal Well No. 110 (Well No. 1-A)

January 23, 1997

Time (am)	Tubing Pressure (psig)	Casing Pressure (psig)	Remarks
9:00	200	74	SI 43 hours
9:05	210	74	Start pressurizing w/N_2 gas
9:08	550	74	
9:10	760	74	
9:13	1100	74	Shut off N_2 gas
9:15	1101.5	74	Start APT
9:20	1099.0	74	
9:25	1098.0	74	
9:30	1097.0	74	
9:35	1097.0	74	
9:40	1097.5	74	
9:45	1097.0	74	
9:50	1096.5	74	
9:55	1096.0	74	
10:00	1095.5	74	
10:05	1095.0	74	
10:10	1094.5	74	
10:15	1094.5	74	Stop APT
10:20	500	74	Bleeding off excess pressure
10:25	200	74	Resume shut-in status

NOTE:

Pressure was measured using HCCG's certified calibrated pressure instrument, a portable digital Eaton Pressure Sensor, Type UPC5000BACB, Serial No. A1258, with optional ranges, 0 to 400 psig, 0 to 1,000 psig and 0 to 2,000 psig and was installed onto the annulus outlet. Note: The 0- 2,000 psig range was utilized for this test. A certificate of calibration (See Appendix C) shows that the pressure sensor was calibrated on December 4, 1996.

HCCG's facility digital transmitter pressure recorder, Honeywell Instruments Corp., Smart Honeywell Model ST 3000, normally has a pressure range from zero to 1,000 psig. However, for the APT, the range was modified by Mr. Wilson Cupples to a range of zero to 1,200 psig. A copy of the computer run (Included in Appendix B) shows that the annulus transmitter and recorder were calibrated as an "End to End" unit. The same calibration standard was used on both the Eaton Pressure Sensor and the facility digital transmitter pressure recorder.

Also, GCWA's digital pressure unit was tied into the annulus and recorded the APT and the data is included in this section. A calibration chart on this tool is included in Appendix c and was calibrated on September 23, 1996.

Company: HOECHST CELANESE CO.
Well: WASTE DISPOSAL WELL # 110 [Thursday: Jan. 23, 1997]
Field: BAY CITY FACILITY

REC #	DAY	REAL TIME	DT (HRS)	ANNULAR (PSIA)	DELTA (PSI)
		START ANNULAR PRESSURE TEST			
		PANEX MODEL 1100 SERIAL 2-1207			
		CALIBRATED 09-23-1996			
1	0	9:10:30	0.0000	1111.97	0.00
2	0	9:11: 0	0.0083	1112.19	0.22
3	0	9:11:30	0.0167	1112.26	0.29
4	0	9:12: 0	0.0250	1112.22	0.25
5	0	9:12:30	0.0333	1112.03	0.06
6	0	9:13: 0	0.0417	1111.93	-0.04
7	0	9:13:30	0.0500	1111.77	-0.20
8	0	9:14: 0	0.0583	1111.71	-0.26
9	0	9:14:30	0.0667	1111.75	-0.22
10	0	9:15: 0	0.0750	1111.77	-0.20
11	0	9:15:30	0.0833	1111.75	-0.22
12	0	9:16: 0	0.0917	1111.73	-0.24
13	0	9:16:30	0.1000	1111.69	-0.28
14	0	9:17: 0	0.1083	1111.62	-0.35
15	0	9:17:30	0.1167	1111.47	-0.50
16	0	9:18: 0	0.1250	1111.27	-0.70
17	0	9:18:30	0.1333	1111.06	-0.91
18	0	9:19: 0	0.1417	1111.05	-0.92
19	0	9:19:30	0.1500	1111.06	-0.91
20	0	9:20: 0	0.1583	1110.95	-1.02
21	0	9:20:30	0.1667	1110.79	-1.18
22	0	9:21: 0	0.1750	1110.59	-1.38
23	0	9:21:30	0.1833	1110.42	-1.55
24	0	9:22: 0	0.1917	1110.38	-1.59
25	0	9:22:30	0.2000	1110.35	-1.62
26	0	9:23: 0	0.2083	1110.30	-1.67
27	0	9:23:30	0.2167	1110.25	-1.72
28	0	9:24: 0	0.2250	1110.20	-1.77
29	0	9:24:30	0.2333	1110.17	-1.80
30	0	9:25: 0	0.2417	1110.14	-1.83
31	0	9:25:30	0.2500	1110.14	-1.83
32	0	9:26: 0	0.2583	1110.17	-1.80
33	0	9:26:30	0.2667	1110.14	-1.83
34	0	9:27: 0	0.2750	1110.08	-1.89
35	0	9:27:30	0.2833	1110.04	-1.93
36	0	9:28: 0	0.2917	1110.04	-1.93
37	0	9:28:30	0.3000	1110.05	-1.92
38	0	9:29: 0	0.3083	1110.06	-1.91
39	0	9:29:30	0.3167	1110.06	-1.91
40	0	9:30: 0	0.3250	1110.03	-1.94
41	0	9:30:30	0.3333	1109.96	-2.01
42	0	9:31: 0	0.3417	1109.89	-2.08
43	0	9:31:30	0.3500	1109.91	-2.06
44	0	9:32: 0	0.3583	1109.89	-2.08
45	0	9:32:30	0.3667	1109.86	-2.11
46	0	9:33: 0	0.3750	1109.78	-2.19
47	0	9:33:30	0.3833	1109.72	-2.25

REC #	DAY	REAL TIME	DT (HRS)	ANNULAR (PSIA)	DELTA (PSI)
48	0	9:34: 0	0.3917	1109.68	-2.29
49	0	9:34:30	0.4000	1109.57	-2.40
50	0	9:35: 0	0.4083	1109.61	-2.36
51	0	9:35:30	0.4167	1109.64	-2.33
52	0	9:36: 0	0.4250	1109.59	-2.38
53	0	9:36:30	0.4333	1109.45	-2.52
54	0	9:37: 0	0.4417	1109.28	-2.69
55	0	9:37:30	0.4500	1109.19	-2.78
56	0	9:38: 0	0.4583	1108.84	-3.13
57	0	9:38:30	0.4667	1108.71	-3.26
58	0	9:39: 0	0.4750	1108.69	-3.28
59	0	9:39:30	0.4833	1108.69	-3.28
60	0	9:40: 0	0.4917	1108.71	-3.26
61	0	9:40:30	0.5000	1108.71	-3.26
62	0	9:41: 0	0.5083	1108.72	-3.25
63	0	9:41:30	0.5167	1108.64	-3.33
64	0	9:42: 0	0.5250	1108.61	-3.36
65	0	9:42:30	0.5333	1108.57	-3.40
66	0	9:43: 0	0.5417	1108.58	-3.39
67	0	9:43:30	0.5500	1108.55	-3.42
68	0	9:44: 0	0.5583	1108.47	-3.50
69	0	9:44:30	0.5667	1108.45	-3.52
70	0	9:45: 0	0.5750	1108.43	-3.54
71	0	9:45:30	0.5833	1108.40	-3.57
72	0	9:46: 0	0.5917	1108.36	-3.61
73	0	9:46:30	0.6000	1108.27	-3.70
74	0	9:47: 0	0.6083	1108.19	-3.78
75	0	9:47:30	0.6167	1108.16	-3.81
76	0	9:48: 0	0.6250	1108.15	-3.82
77	0	9:48:30	0.6333	1108.14	-3.83
78	0	9:49: 0	0.6417	1108.19	-3.78
79	0	9:49:30	0.6500	1108.23	-3.74
80	0	9:50: 0	0.6583	1108.21	-3.76
81	0	9:50:30	0.6667	1108.16	-3.81
82	0	9:51: 0	0.6750	1108.15	-3.82
83	0	9:51:30	0.6833	1108.17	-3.80
84	0	9:52: 0	0.6917	1108.14	-3.83
85	0	9:52:30	0.7000	1108.09	-3.88
86	0	9:53: 0	0.7083	1108.06	-3.91
87	0	9:53:30	0.7167	1108.02	-3.95
88	0	9:54: 0	0.7250	1108.02	-3.95
89	0	9:54:30	0.7333	1107.99	-3.98
90	0	9:55: 0	0.7417	1107.98	-3.99
91	0	9:55:30	0.7500	1108.00	-3.97
92	0	9:56: 0	0.7583	1107.99	-3.98
93	0	9:56:30	0.7667	1107.93	-4.04
94	0	9:57: 0	0.7750	1107.89	-4.08
95	0	9:57:30	0.7833	1107.84	-4.13
96	0	9:58: 0	0.7917	1107.81	-4.16
97	0	9:58:30	0.8000	1107.80	-4.17

REC #	DAY	REAL TIME	DT (HRS)	ANNULAR (PSIA)	DELTA (PSI)
98	0	9:59: 0	0.8083	1107.76	-4.21
99	0	9:59:30	0.8167	1107.67	-4.30
100	0	10: 0: 0	0.8250	1107.61	-4.36
101	0	10: 0:30	0.8333	1107.61	-4.36
102	0	10: 1: 0	0.8417	1107.60	-4.37
103	0	10: 1:30	0.8500	1107.53	-4.44
104	0	10: 2: 0	0.8583	1107.50	-4.47
105	0	10: 2:30	0.8667	1107.45	-4.52
106	0	10: 3: 0	0.8750	1107.43	-4.54
107	0	10: 3:30	0.8833	1107.39	-4.58
108	0	10: 4: 0	0.8917	1107.31	-4.66
109	0	10: 4:30	0.9000	1107.16	-4.81
110	0	10: 5: 0	0.9083	1107.03	-4.94
111	0	10: 5:30	0.9167	1106.95	-5.02
112	0	10: 6: 0	0.9250	1106.85	-5.12
113	0	10: 6:30	0.9333	1106.82	-5.15
114	0	10: 7: 0	0.9417	1106.81	-5.16
115	0	10: 7:30	0.9500	1106.84	-5.13
116	0	10: 8: 0	0.9583	1106.88	-5.09
117	0	10: 8:30	0.9667	1106.89	-5.08
118	0	10: 9: 0	0.9750	1106.91	-5.06
119	0	10: 9:30	0.9833	1106.89	-5.08
120	0	10:10: 0	0.9917	1106.89	-5.08
121	0	10:10:30	1.0000	1106.88	-5.09

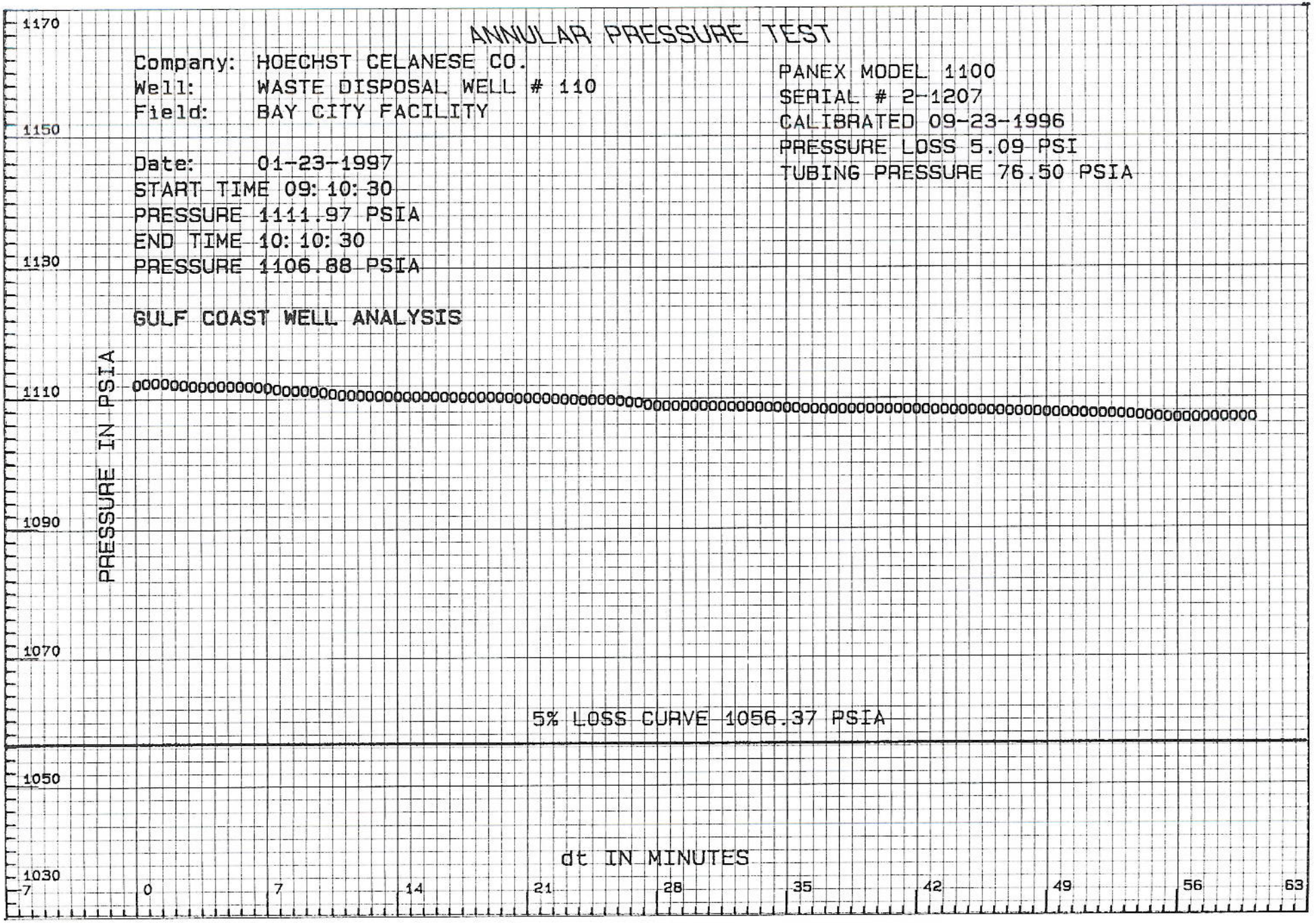
ANNULAR PRESSURE TEST

Company: HOECHST CELANESE CO.
Well: WASTE DISPOSAL WELL # 110
Field: BAY CITY FACILITY

PANEX MODEL 1100
SERIAL # 2-1207
CALIBRATED 09-23-1996
PRESSURE LOSS 5.09 PSI
TUBING PRESSURE 76.50 PSIA

Date: 01-23-1997
START TIME 09:10:30
PRESSURE 1111.97 PSIA
END TIME 10:10:30
PRESSURE 1106.88 PSIA

GULF COAST WELL ANALYSIS



GULF
COAST
WELL
ANALYSIS

COASTAL WIRELINE SERVICES, INC.

Hoechst Celanese
Waste Disposal Well # 110
Bay City Facility
Bay City, Texas
January 23, 1997

ANNULAR PRESSURE TEST

This test included the hook up of a Panex Model 1100 electronic pressure transducer # 2-1207 calibrated September 23, 1996 on the tubing casing side of the well. The test began by pressuring up the annulus with brine to 1112 psia, then blocked in the annular injection lines. Started annular pressure test at 09:10:30 with an annular pressure of 1111.97 psia and tubing pressure of 76.50 psia. Recorded annular pressure test on computer system for sixty minutes at 30 second intervals. Ended annular pressure test at 10:10:30 with an annular pressure of 1106.88 psia and tubing pressure of 76.50 psia. Annular pressure had a loss of 5.09 psi which is .46%. This test serves to prove the integrity of the casing and tubing above the packer as well as the packer and tubing sealing elements. This test was conducted by Ken Rood (Gulf Coast Well Analysis) and witnessed by Mr. Wes Smith (ECO Solutions) and Mr. Chuck Greene (T.N.R.C.C.).

Sincerely

Stoney Johnson
Engineer G.C.W.A.

3909 Halik Road - Pearland, Texas 77581 - Office 281-485-6548 Fax 281-485-1954

APPENDIX B

RADIOACTIVE TRACER LOG AND GCWA'S INTERPRETATION LETTER

SOLUTIONS, INC.

GULF COAST WELL ANALYSIS

COASTAL WIRELINE SERVICES, INC.

Hoechst Celanese
Waste Disposal Well # 110
Bay City Facility
Bay City, Texas
January 23, 1997

RADIOACTIVE TRACER SURVEY

The two phases of this test included; 1) Determining the flow through and from the tubing by ejecting a slug of radioactive material (Iodine-131 10mci) and monitoring the flow profile as it moves down the tubing and into the formation. 2) Testing the mechanical integrity of the casing, cement, and formation bond by positioning gamma-ray detector slightly above the point where the formation accepts fluid and monitoring the gamma radiation response from an ejected slug of radioactive material. A baseline gamma-ray log was ran from 3,545 feet to 2,900 feet (420 feet above top of packer assembly). The injection rate was 50 gpm for the profile runs and 200 gpm for the time drive surveys.

The first phase of this test incorporates the injection of radioactive slug at 2,900 feet (420 feet above top of packer assembly) and passing the detector through the radioactive material until it passes from the tubing and into the formation. The first slug gave an indication of leaving the packer at 3,320 feet and going into the formation from 3,376 feet to 3,524 feet. Made seven (7) passes and chased slug down to 3,429 feet. This portion of this test was repeated with six (6) passes and slug chased down to 3,420 feet. Profile survey indicates that all fluid is going into injection interval at this time. No indication of any fluid migrating up hole behind pipe above 3,376 feet.

The second phase of this test involved setting lower detector at 3,356 feet (20 feet above top of perfs.) and ejecting a slug of radioactive material at 3,351 feet and recorded on time drive for twenty two (22) minutes with an injection rate of 200 gpm. This portion of this test was repeated at same depth and rate. Time drive survey indicates no fluid migrating up hole behind pipe at this time.

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RADIOACTIVE TRACER SURVEY CONTINUE

A Base after survey gamma ray log was ran from 3,545 feet to 2,900 feet and compared to original base gamma ray log which indicated no residue of radioactive material above 3,376 feet in formation, casing, tubing, or packer.

Radioactive Tracer Survey was conducted by Dannie Koonce (Gulf Coast Well Analysis) and witnessed by Mr. Wes Smith (ECO Solution) and Mr. Chuck Greene (T.N.R.C.C.).

Sincerely

Stoney Johnson
Engineer G.C.W.A.

Hoechst Celanese Chemical Group, Ltd.
Radioactive Tracer Survey
WDW-110
(January 23, 1997)

TRACER #1

No.	Depth		Time		Slug		Remarks
Pass	Start	Stop	Start	Stop	Depth	Time	
	2900		11:52:00				3 seconds
1	3000	2900	11:52:15	11:54:20	2971	11:53:25	50 gpm rate
2	3200	2920	11:55:55	11:59:20	3163	11;56:35	
3	3460	3100	12:02:15	12:07:15	3400	12:03:10	
4	3470	3340	12:10:00	12:12:05	3419	12:11:00	Injection press - 220 psig
5	3460	3370	12:14:00	12:16:05	3422	12:15:08	
6	3460	3370	12:18:40	12:20:35	3425	12:14:48	
7	3460	3370	12:24:00	12:26:00	3429	12:24:55	Stop tracer survey

TRACER #2

	2900		12:29:20				4 second slug
1	3040	2900	12:30:05	12:31:25	2974	12:30:50	
2	3300	2920	12:33:00	12:36:22	3150	12:33:50	
3	3470	3070	12:38:52	12:44:12	3391	12:40:05	Injection press - 230 psig
4	3470	3340	12:48:42	12:51:25	3415	12:50:00	
5	3470	3370	12:54:15	12:55:52	3416	12:55:20	
6	3470	3370	12:57:25	12:59:25	3420	12:58:35	Stop tracer survey

Stationary Survey @3356' (two minute statistical check & 4 second slug with injection rate at 200 gpm. Start stationary survey at 1:04:25 PM and end at 1:24:25 PM - OK. Repeated stationary survey for 20 minutes, i.e 1:25:20 PM to 1:45:20 PM - OK.

SOLUTIONS, INC.


GRAPHIC RECORDING CHARTS
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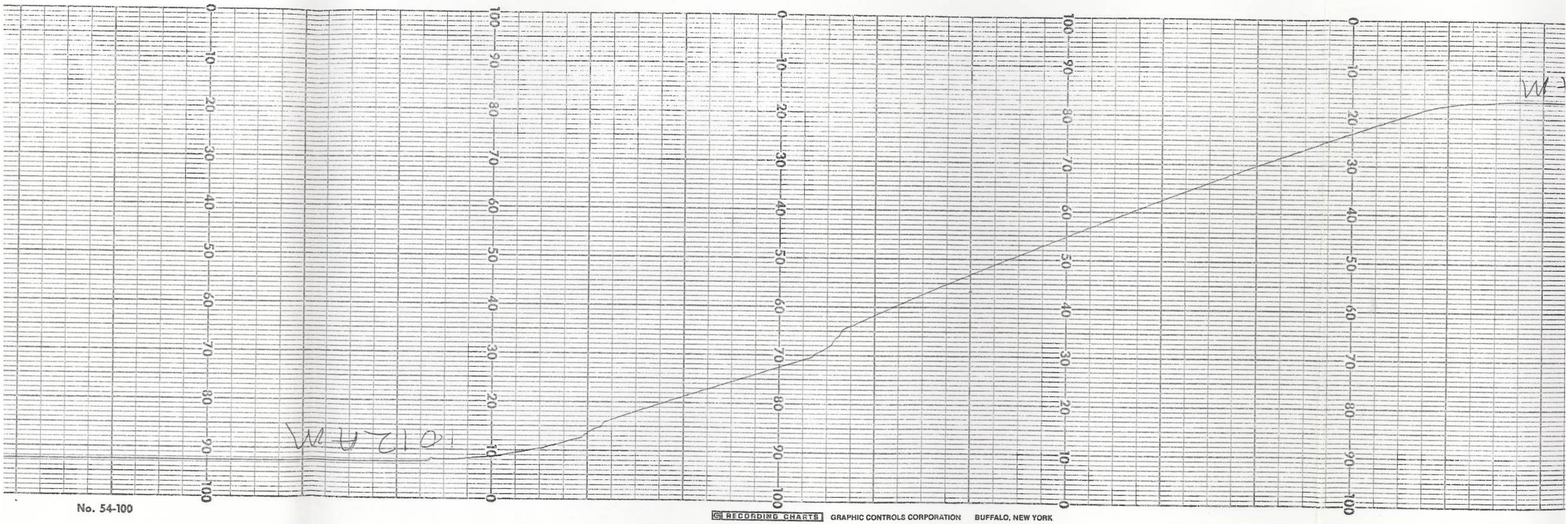
1019 AM
TRANSMITTER
1018 AM



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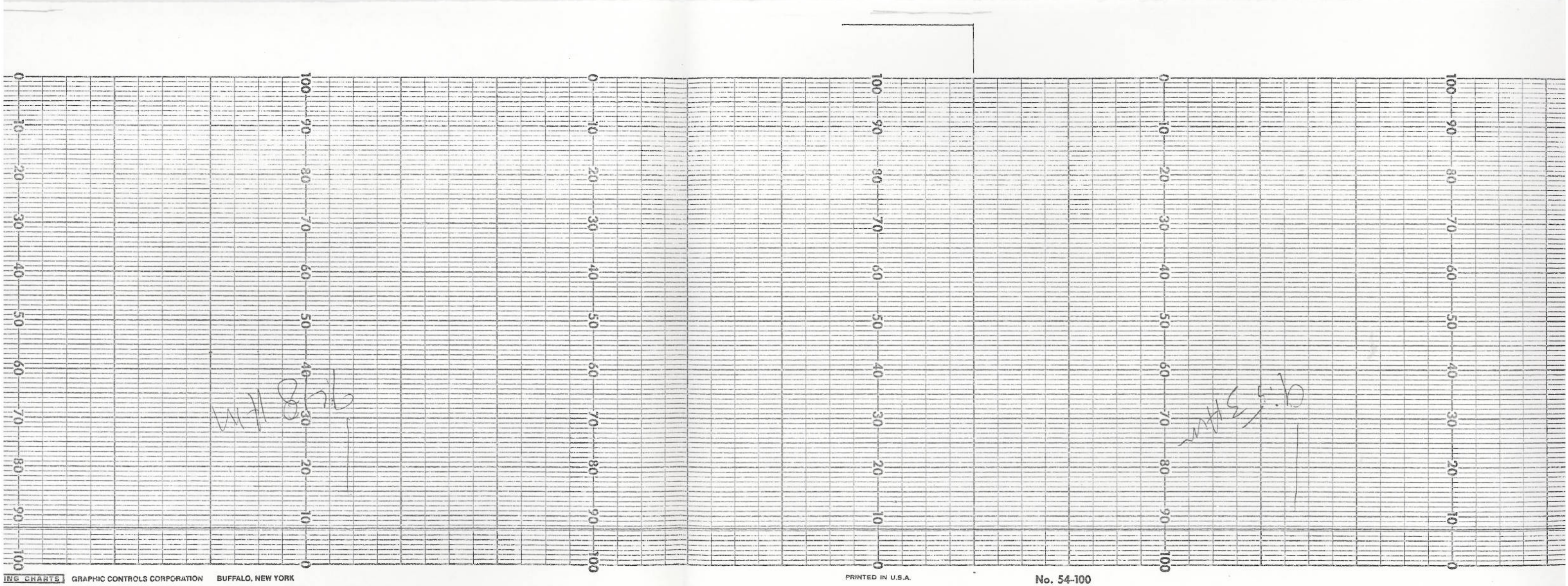

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No. 54-100

GRAPH RECORDING CHARTS

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No. 54-100

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9:38 Am

9:33 Am

PRINTED IN U.S.A. No. 54-100

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9:18 AM

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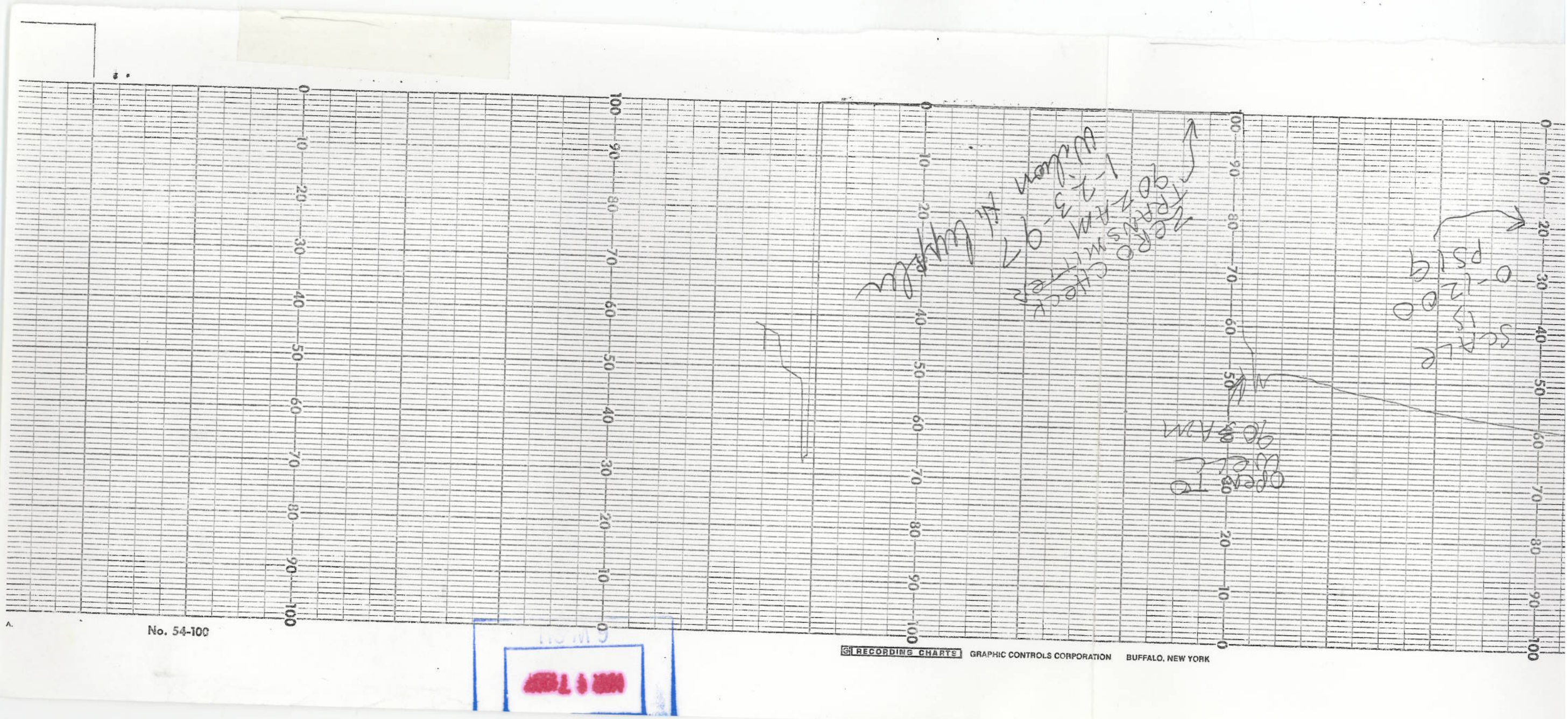
SCALE
0-200
PSIG

ZERO CHECK
TRANSMITTER
908AM
1-23-97
William H. Lippelt


No. 54-100
RECORDING CHARTS GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

Gulf Coast Well Analysis

RADIOACTIVE TRACER SURVEY

MECHANICAL INTEGRITY TEST

FILING NO.

COMPANY HOECHST CELANESE CHEMICAL GROUP, LTD
WELL WASTE DISPOSAL WELL # 110 WELL # 1-A
FIELD BAY CITY PLANT
COUNTY MATAGORDA STATE TEXAS

LOCATION:

N/A

SEC TWP RGE

OTHER SERV:
B.H.P.
A.P.T.

PERMANENT DATUM: GROUND LEVEL ELEV: N/A

LOG MEASURED FROM 17.0 FT ABOVE PERM DATUM
DRILLING MEASURED FROM RKB

ELEVATION:
KB. N/A
DF. N/A
GL. N/A

DATE	23-JAN-1997		
RUN NO.	ONE		
DEPTH - DRILLER	3550		
DEPTH - LOGGER	3546		
BOTTOM LOGGED INT	3545		
TOP LOGGED INT	2900		
TYPE FLUID IN HOLE	WATER		
SALINITY PPM CL.	N/A		
DENSITY	N/A		
LEVEL	INJECTING		
MAX TEMP DEG F	N/A		
OPERATING RIG TIME	MAST		
OPERATOR	D. KOONCE		(TNRCC)
WITNESSED BY	MR WES SMITH	(ECO)	MR GREENE

RUN NO.	BORE HOLE RECORD			CASING RECORD			
	BIT	FROM	TO	SIZE	WGT.	FROM	TO
				7.625	N/A	SURF.	3550
				5.500	N/A	SURF.	3376

Equipment Data

Run	TRUCK #	TOOL #	INJECT #	ISOTOPE	LIQUID
	P 102	1235	1336	I-131	WS

Calibration Data

Run No.	SENS UPPER	SENS LOWER	T.C. UPPER	T.C. LOW
	200	2	1000	2

Logging Data

Run No.	Depths From	Depths To	Speed Ft/Min	TOOL SPACING			
1	3545'	2900'	35	3'	4'		
				-+------+------+---			
				GR	CCL	EJEC	CABLE
				LO		UP	HEAD

RADIOACTIVE TRACER SURVEY INDICATES THAT ALL FLUID IS GOING INTO DISPOSAL INTERVAL AT THIS TIME. NO INDICATION OF FLUID MOVEMENT UP HOLE BEHIND CASING OR PACKER LEAKING.

CORRECTED TO RADIOACTIVE TRACER SURVEY RAN 25-JAN-1995

01/23/1997 RADIOACTIVE TRACER LOG SUMMARY SHEET 1 OF 1

Run	Time	Depth		Rate	TC	Description
1	08:53	09:07	3545 2900	0		BASE LOG BEFORE SURVEY
2	09:09	09:15	3200 2900	0		REPEAT OF BASE LOG
3	09:22	09:27	3310	0		STAT CHECK # 1
4	09:30	09:35	3356	0		STAT CHECK # 2
	11:46		2900	50GPM		EJECT SLUG # 1
5	11:47	11:49	3000 2900	50GPM		PASS 1 PEAK @ 2971 @ 11:48
6	11:50	11:54	3200 2920	50GPM		PASS 2 PEAK @ 3163 @ 11:51
7	11:57	12:02	3460 3100	50GPM		PASS 3 PEAK @ 3400 @ 11:58
8	12:04	12:06	3470 3340	50GPM		PASS 4 PEAK @ 3419 @ 12:05
9	12:08	12:11	3470 3370	50GPM		PASS 5 PEAK @ 3422 @ 12:10
10	12:13	12:15	3460 3370	50GPM		PASS 6 PEAK @ 3425 @ 12:14

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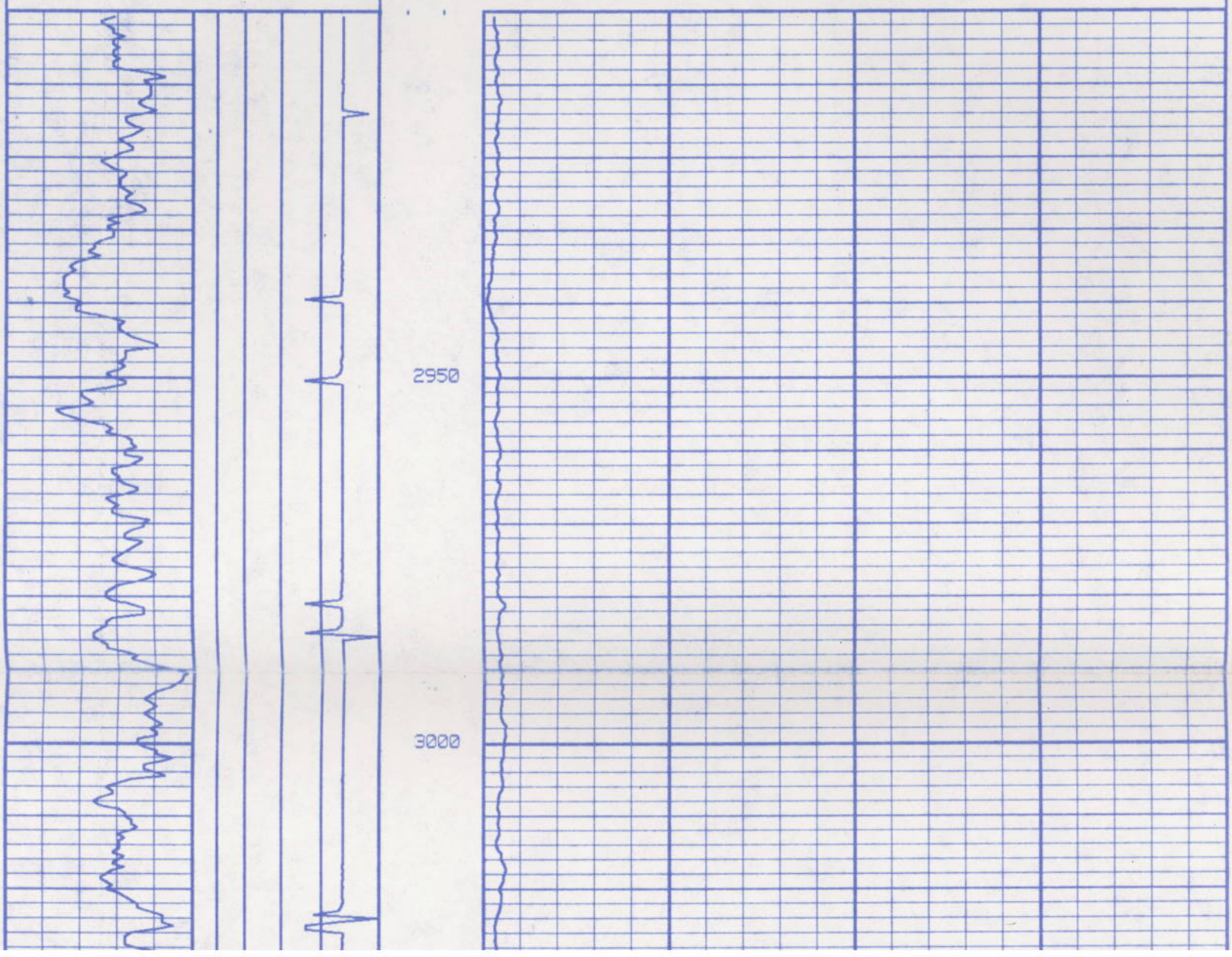
6	11:50	11:54	3200	2920	50GPM		PASS 2 PEAK @ 3163 @ 11:51
7	11:57	12:02	3460	3100	50GPM		PASS 3 PEAK @ 3400 @ 11:58
8	12:04	12:06	3470	3340	50GPM		PASS 4 PEAK @ 3419 @ 12:05
9	12:08	12:11	3470	3370	50GPM		PASS 5 PEAK @ 3422 @ 12:10
10	12:13	12:15	3460	3370	50GPM		PASS 6 PEAK @ 3425 @ 12:14
11	12:18	12:20	3460	3370	50GPM		PASS 7 PEAK @ 3429 @ 12:19
	12:24		2900		50GPM		EJECT SLUG # 2
12	12:24	12:26	3040	2900	50GPM		PASS 1 PEAK @ 2974 @ 12:25
13	12:27	12:31	3200	2900	50GPM		PASS 2 PEAK @ 3152 @ 12:28
14	12:33	12:39	3470	3070	50GPM		PASS 3 PEAK @ 3391 @ 12:35
15	12:43	12:46	3470	3340	50GPM		PASS 4 PEAK @ 3415 @ 12:45
16	12:49	12:50	3470	3370	50GPM		PASS 5 PEAK @ 3416 @ 12:50
17	12:52	12:54	3470	3370	50GPM		PASS 6 PEAK @ 3420 @ 12:53
18	12:57	13:19	3356		200		TIME DRIVE SURVEY # 1
19	13:20	13:42	3356		200		TIME DRIVE SURVEY # 2
20	13:48	14:03	3545	2900	0		BASE LOG AFTER SURVEY

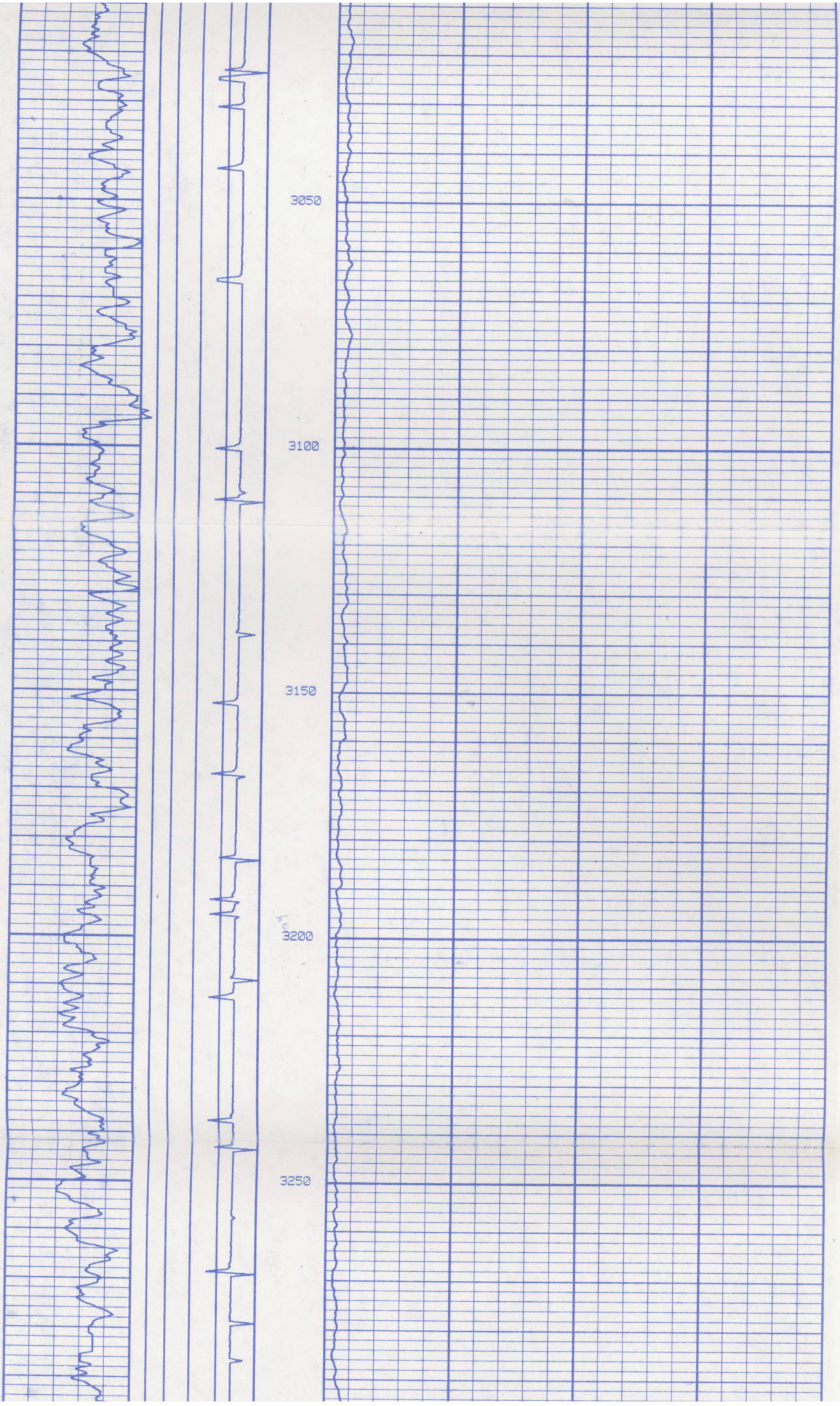
START DEPTH 2900FT DATE: 838 01-2 TIME: 7-97 4 FILE: BASE PLAYBACK PROGRAM

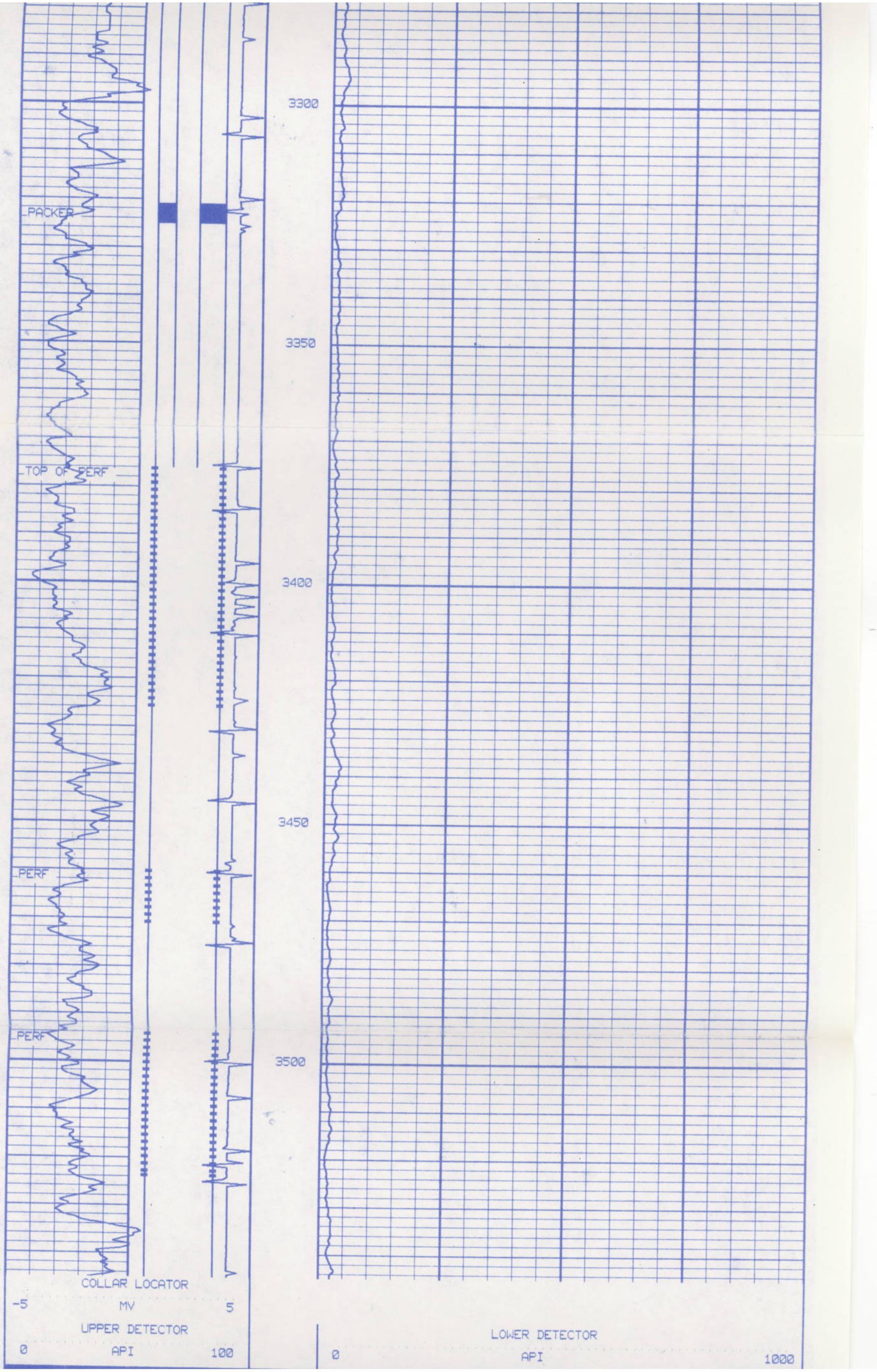
BASE LOG BEFORE SURVEY PUMP RATE 0 GPM

START TIME 08:53 @ 3545

END TIME 09:07 @ 2900




3050
3100
3150
3200
3250


PACKER
TOP OF PERF
PERF
PERF
3300
3350
3400
3450
3500
COLLAR LOCATOR
-5
MV
5
UPPER DETECTOR
0
API
100
LOWER DETECTOR
0
API
1000

COLLAR LOCATOR

-5 MV 5

UPPER DETECTOR

0 API 100

LOWER DETECTOR

0 API 1000

BASE LOG BEFORE SURVEY PUMP RATE 0 GPM

START TIME 08:53 @ 3545

END TIME 09:07 @ 2900

STOP DEPTH 3545FT DATE: 838 01-2 TIME: 7-97 4 FILE: BASE PLAYBACK PROGRAM

START DEPTH 2900FT DATE: 838 01-2 TIME: 7-97 4 FILE: BASE PLAYBACK PROGRAM

REPEAT BASE BEFORE SURVEY PUMP RATE 0 GPM

START TIME 09:09 @ 3200

END TIME 09:15 @ 2900

UPPER DETECTOR

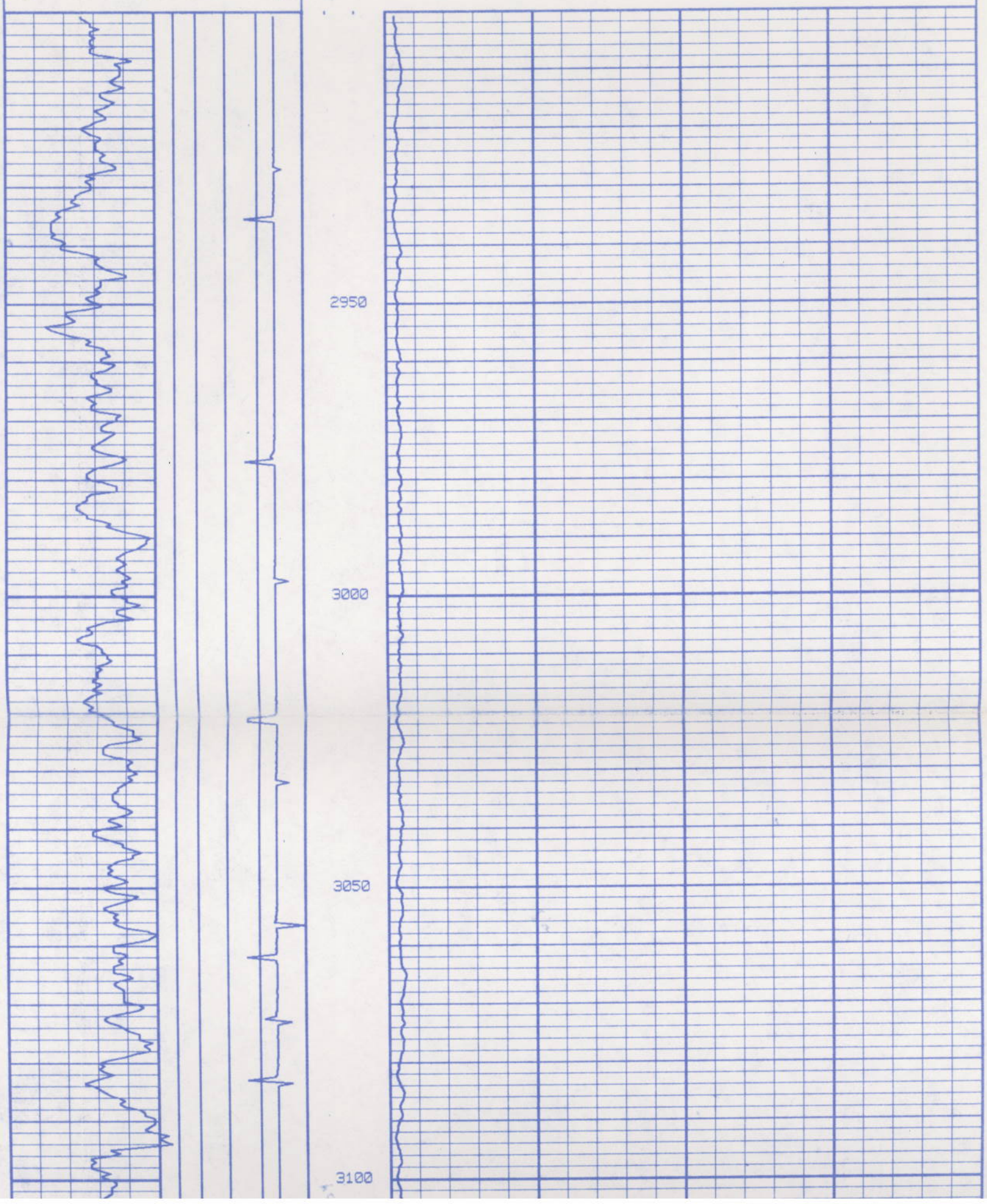
0 API 100

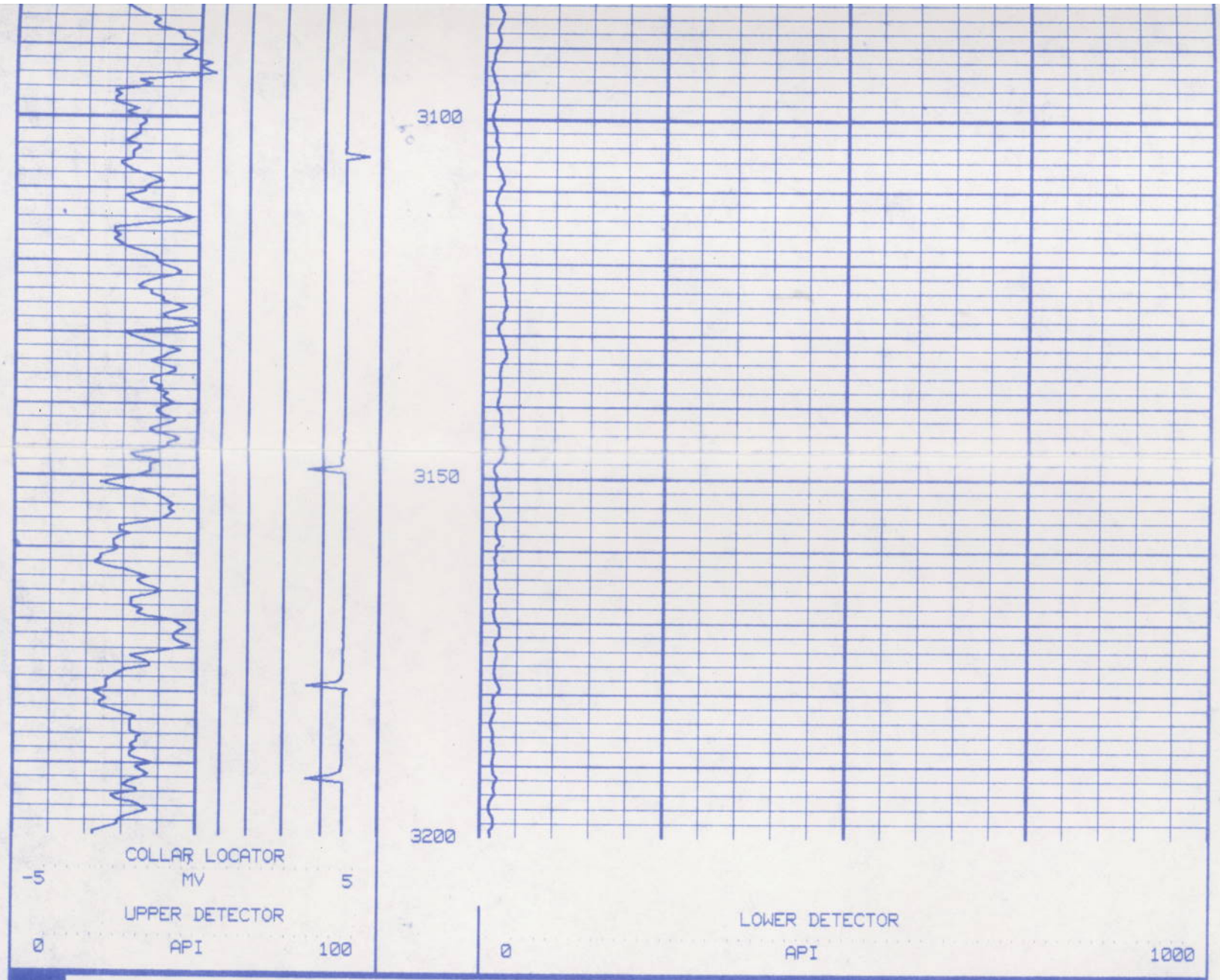
LOWER DETECTOR

0 API 1000

COLLAR LOCATOR

-5 MV 5



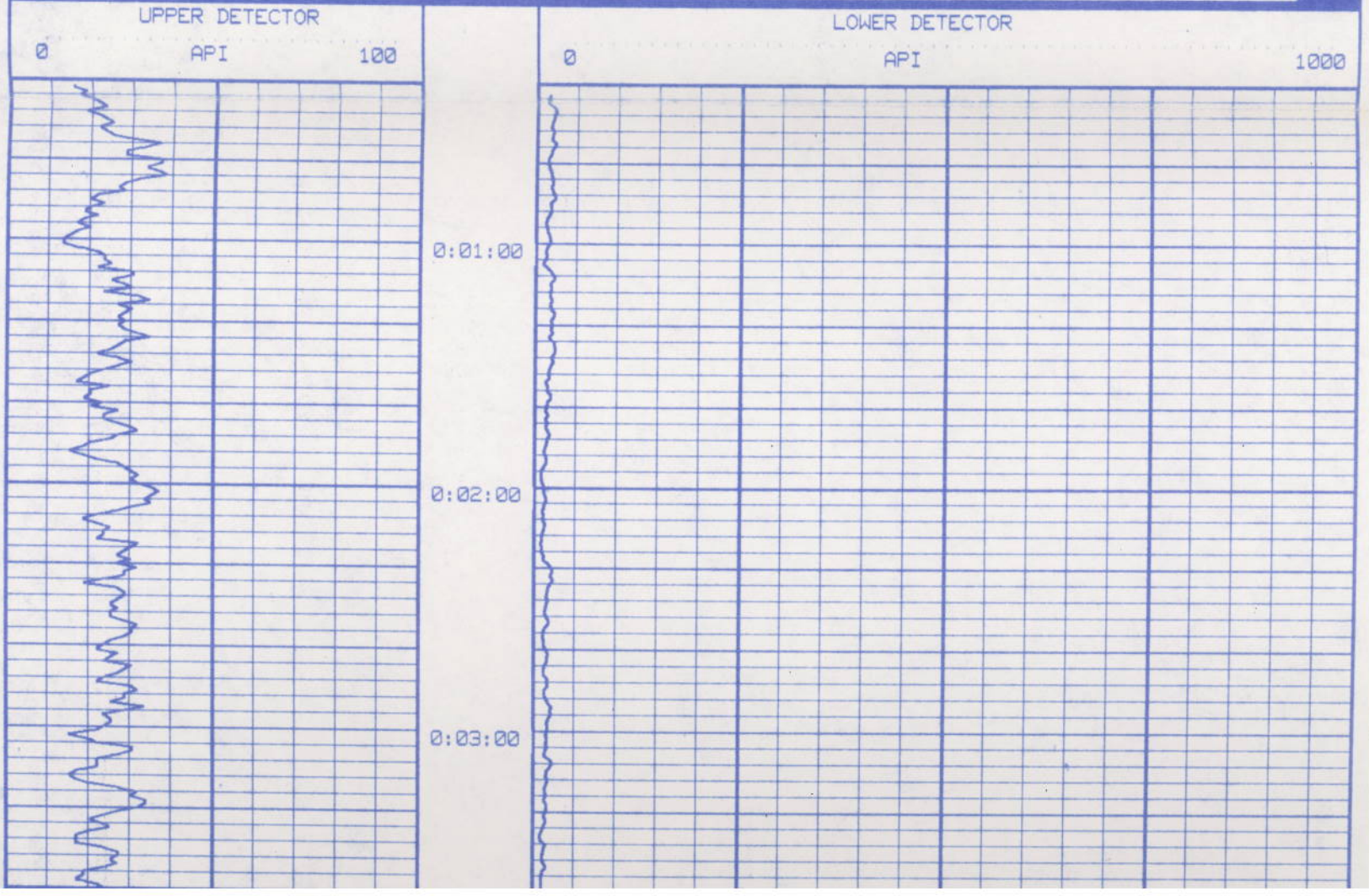


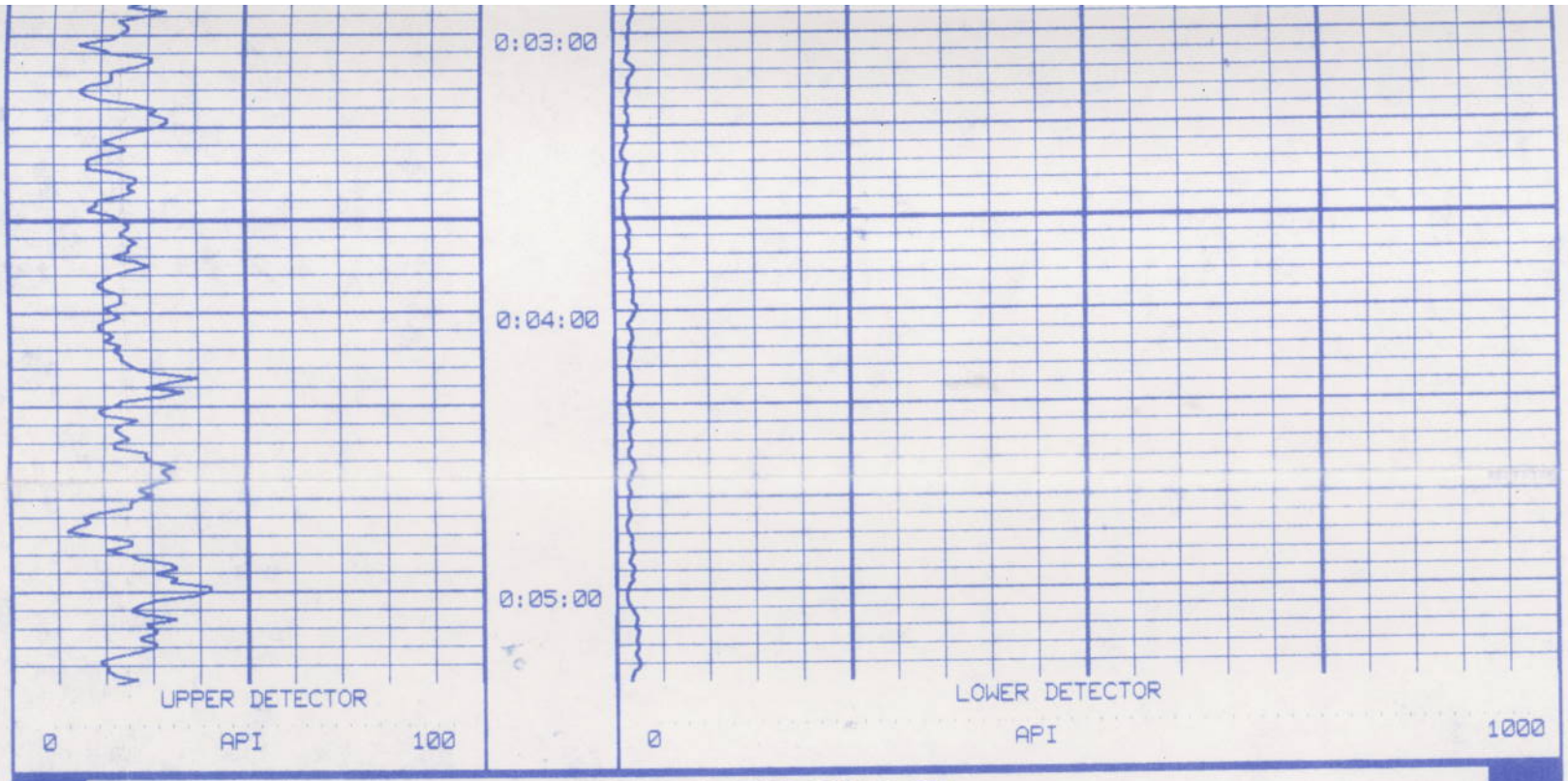
REPEAT BASE BEFORE SURVEY PUMP RATE 0 GPM
START TIME 09:09 @ 3200
END TIME 09:15 @ 2900

STOP DEPTH 3200FT DATE: 838 01-2 TIME: 7-97 4 FILE: BASE PLAYBACK PROGRAM

START DEPTH 0FT DATE: 800 01-2 TIME: 3-97 9 FILE: STAT PLAYBACK PROGRAM

STAT CHECK # 1 PUMP RATE 0 GPM
START TIME 09:22 END TIME 09:27
UPPER GR 3300 LOWER GR 3310



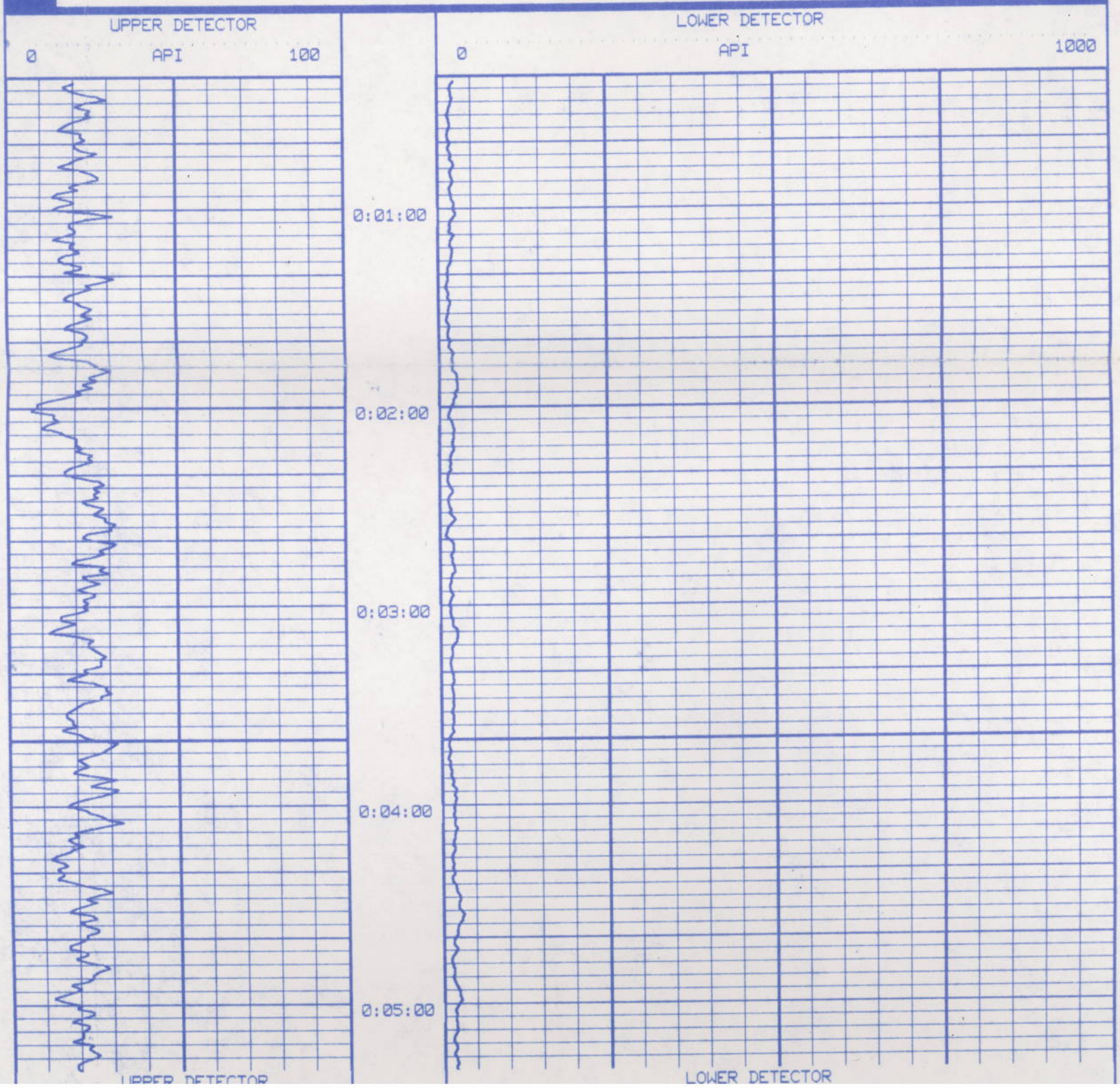


STAT CHECK # 1 PUMP RATE 0 GPM
START TIME 09:22 END TIME 09:27
UPPER GR 3300 LOWER GR 3310

STOP DEPTH 150FT DATE: 800 01-2 TIME: 3-97 9 FILE: STAT PLAYBACK PROGRAM

START DEPTH 0FT DATE: 800 01-2 TIME: 3-97 9 FILE: STAT PLAYBACK PROGRAM

STAT CHECK # 2 PUMP RATE 0 GPM
START TIME 09:30 END TIME 09:35
UPPER GR 3346 LOWER GR 3356



UPPER DETECTOR

0 API 100

0:05:00

LOWER DETECTOR

0 API 1000

STAT CHECK # 2 PUMP RATE 0 GPM

START TIME 09:30 END TIME 09:35

UPPER GR 3346 LOWER GR 3356

STOP DEPTH 150FT DATE: 800 01-2 TIME: 3-97 9 FILE: STAT PLAYBACK PROGRAM

START DEPTH 2900FT DATE: 168 01-2 TIME: 7-97 5 FILE: PRO1A PLAYBACK PROGRAM

PROFILE # 1 SLUG # 1 PUMP RATE 50 GPM

START TIME 11:46 END TIME 12:20

DEPTH LOGGED 3470-2900

COLLAR LOCATOR

-5 MV 5

LOWER DETECTOR

0 API 1000

LOWER DETECTOR

0 API 1000

LOWER DETECTOR

0 API 1000

LOWER DETECTOR

0 API 1000

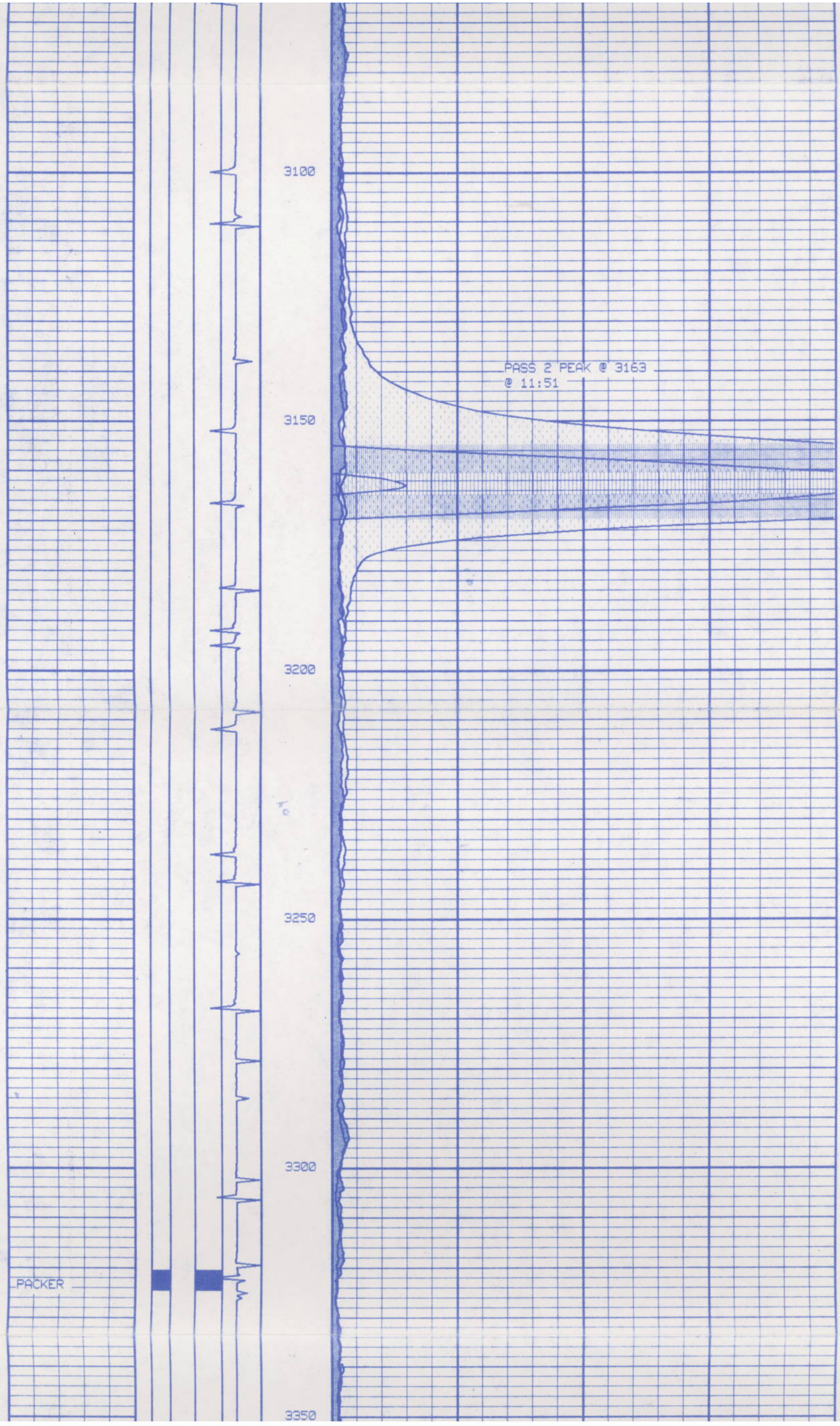
BASE IS SHADED

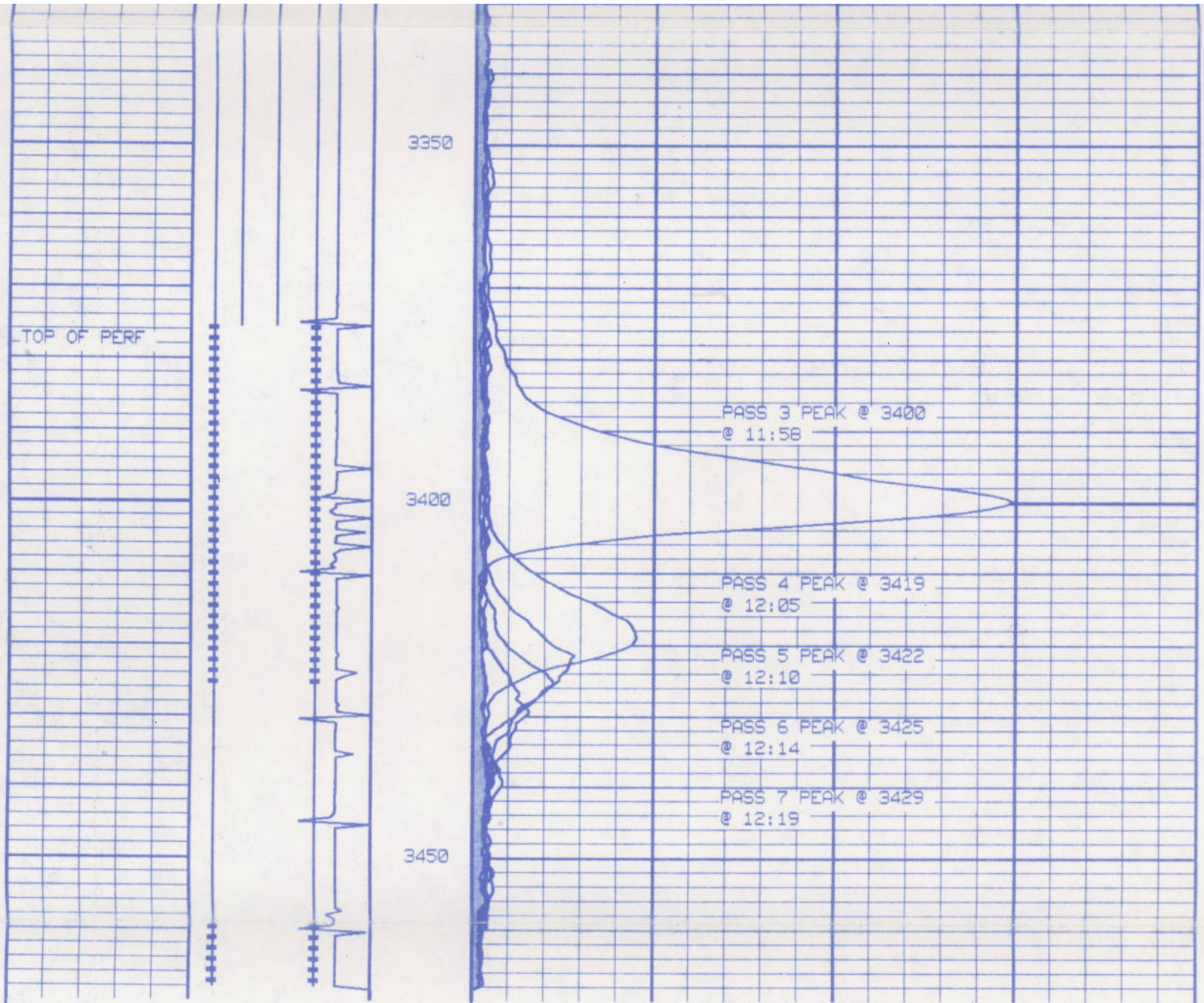
2950

3000

3050

PASS 1 PEAK @ 2971
@ 11:48


3100
3150
3200
3250
3300
3350
PASS 2 PEAK @ 3163
@ 11:51
PACKER

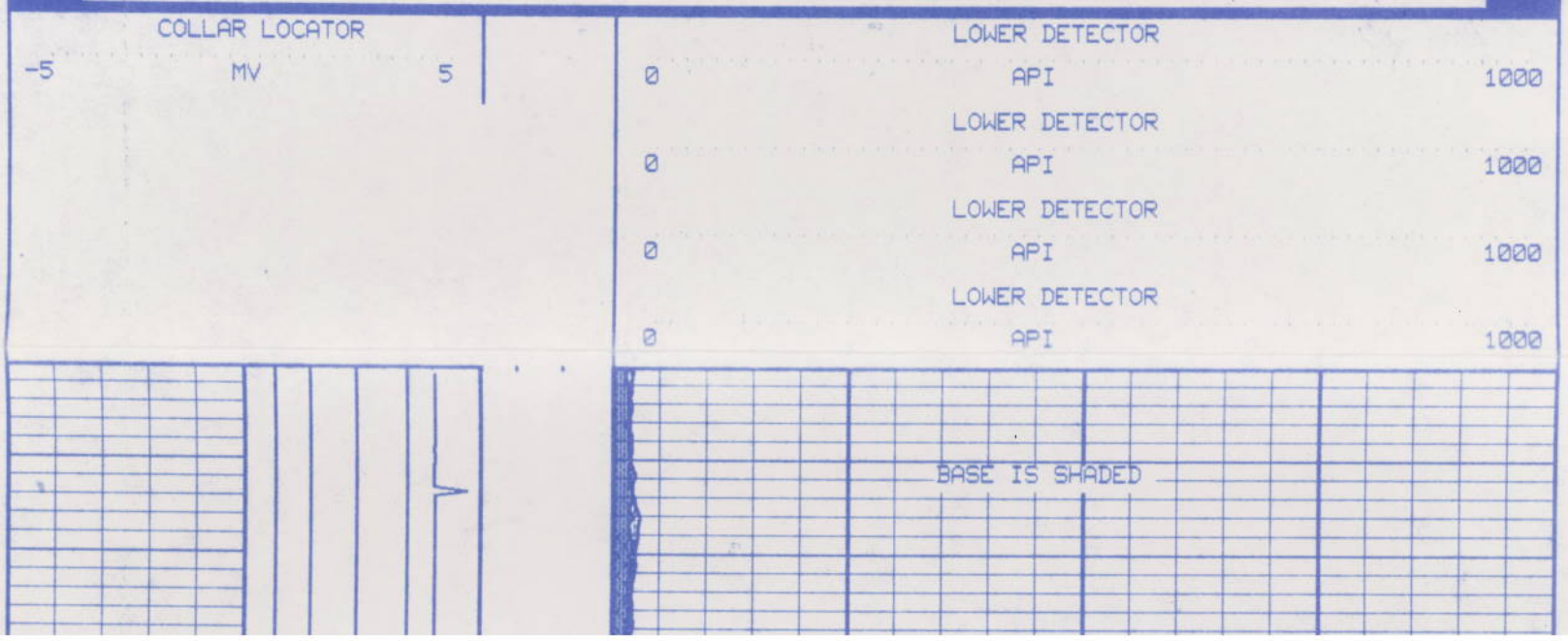


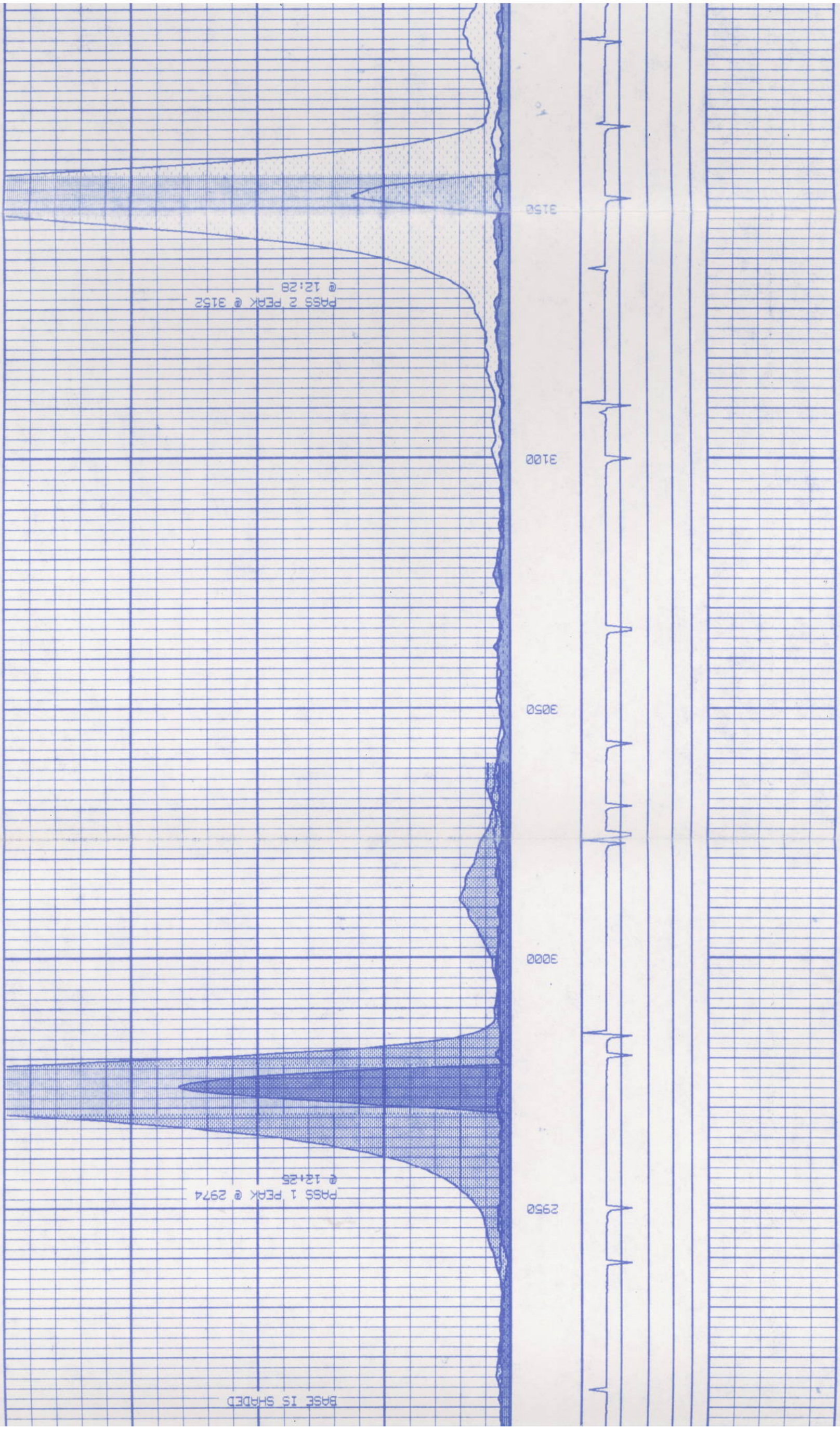
PROFILE # 1 SLUG # 1 PUMP RATE 50 GPM
START TIME 11:46 END TIME 12:20
DEPTH LOGGED 3470-2900

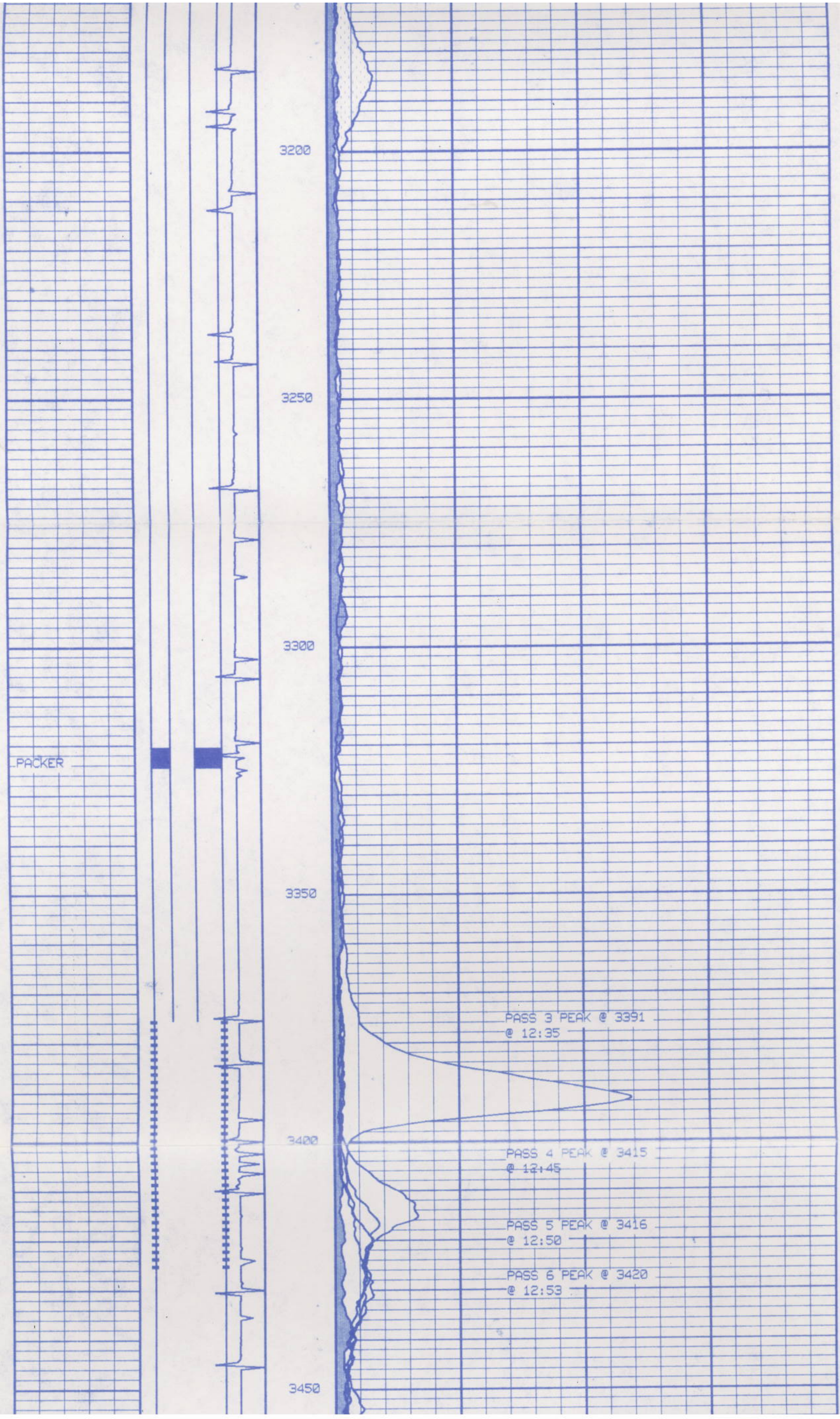
STOP DEPTH 3470FT DATE: 168 01-2 TIME: 7-97 5 FILE: PR01A PLAYBACK PROGRAM

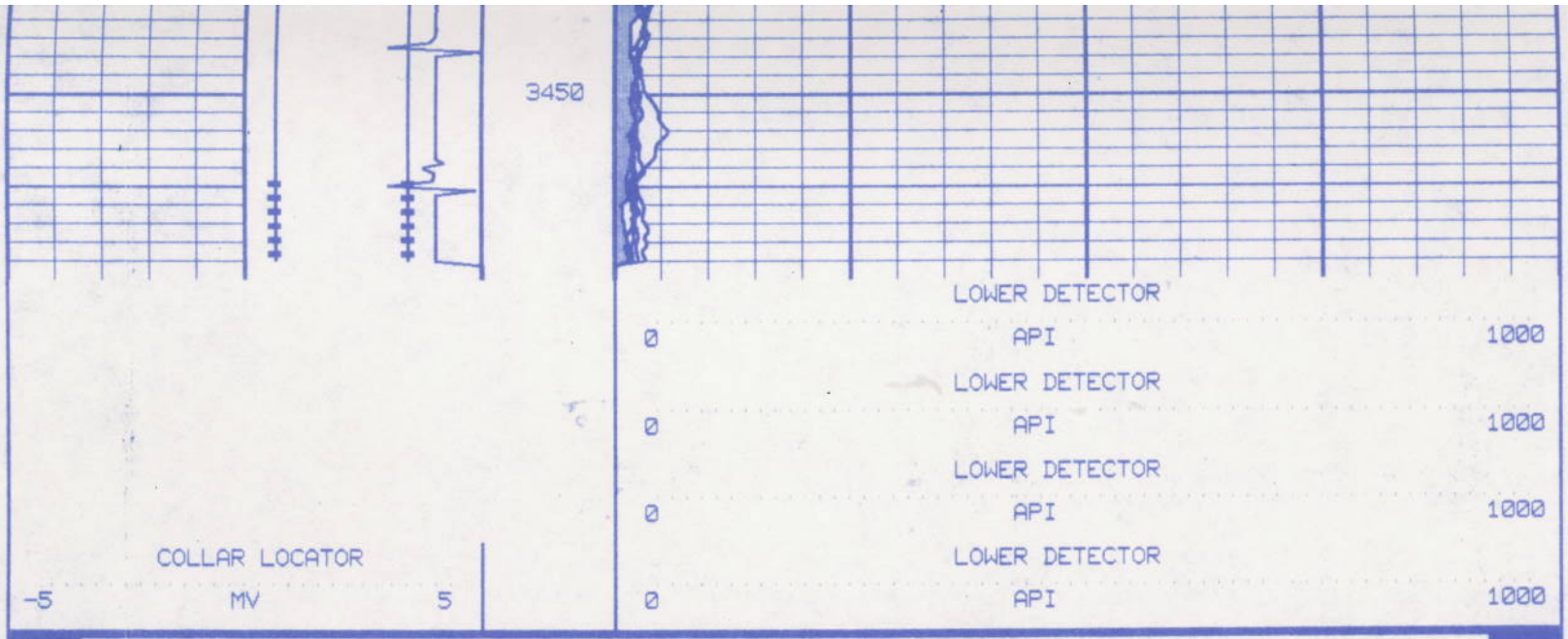
START DEPTH 2900FT DATE: 168 01-2 TIME: 7-97 5 FILE: PR02 PLAYBACK PROGRAM

PROFILE # 1 SLUG # 2 PUMP RATE 50 GPM
START TIME 12:24 END TIME 12:54
DEPTH LOGGED 3470-2900




PASS 2 PEAK @ 3152
@ 12:28
PASS 1 PEAK @ 2974
@ 12:25
BASE IS SHADED
3150
3100
3050
3000
2950


3200
3250
3300
PACKER
3350
PASS 3 PEAK @ 3391
@ 12:35
3400
PASS 4 PEAK @ 3415
@ 12:45
PASS 5 PEAK @ 3416
@ 12:50
PASS 6 PEAK @ 3420
@ 12:53
3450

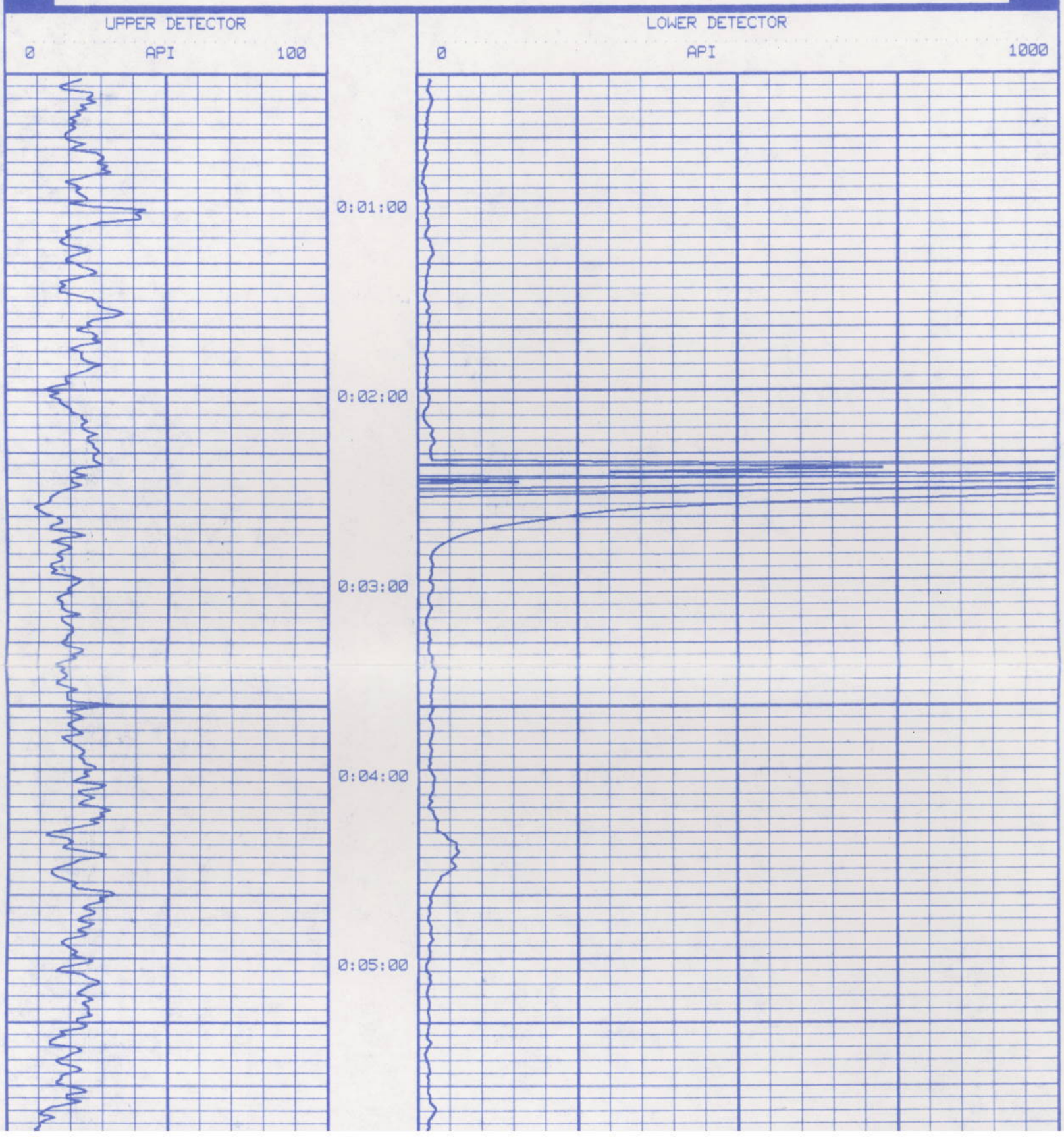


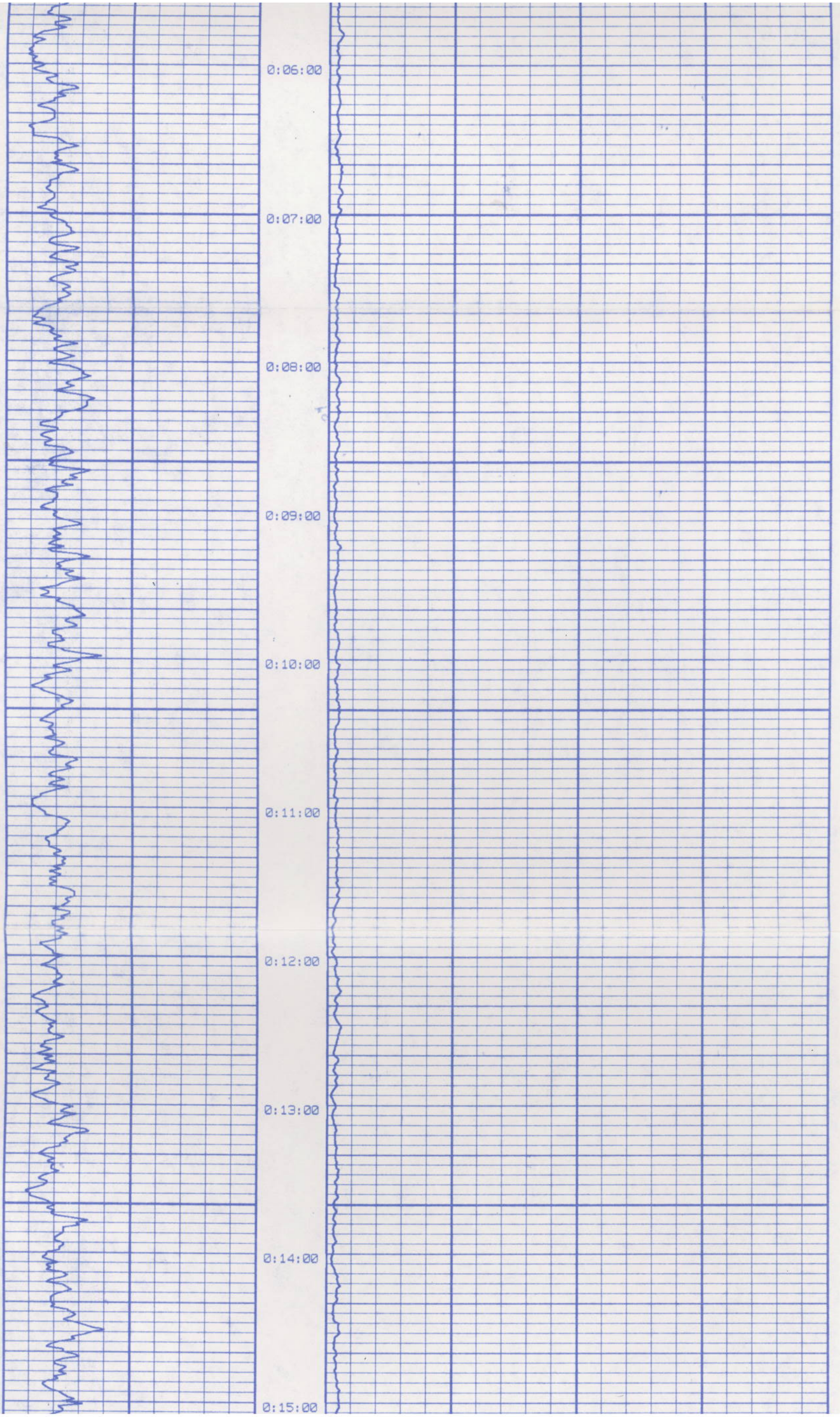
PROFILE # 1 SLUG # 2 PUMP RATE 50 GPM
START TIME 12:24 END TIME 12:54
DEPTH LOGGED 3470-2900

STOP DEPTH 3470FT DATE: 168 01-2 TIME: 7-97 5 FILE: PR02 PLAYBACK PROGRAM

START DEPTH 0FT DATE: 000 01-2 TIME: 3-97 1 FILE: TIME PLAYBACK PROGRAM

TIME DRIVE SURVEY # 1 PUMP RATE 200 GPM
START TIME 12:57 END TIME 13:19
UPPER GR 3346 LOWER GR 3356




0:06:00
0:07:00
0:08:00
0:09:00
0:10:00
0:11:00
0:12:00
0:13:00
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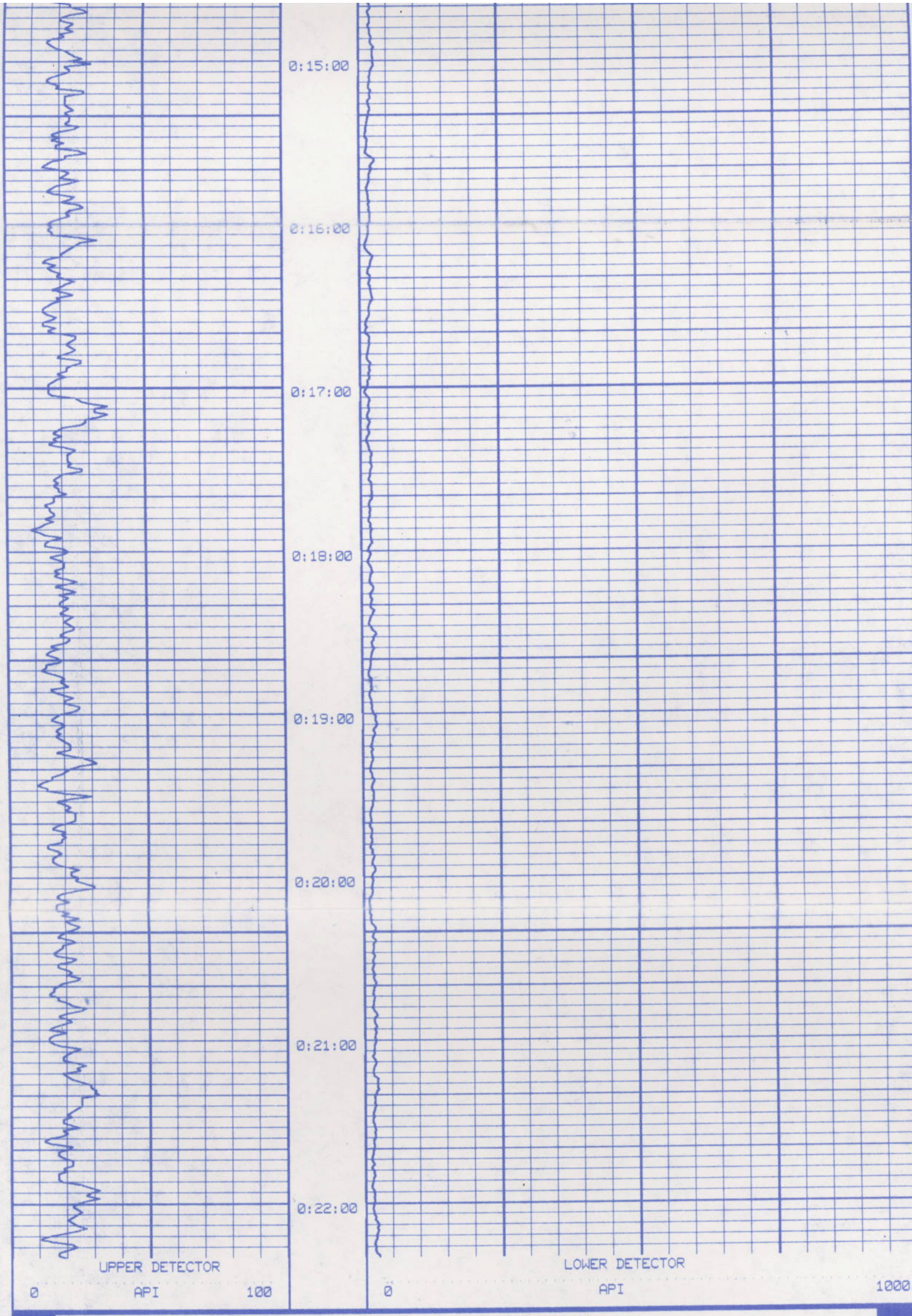
0:15:00



TIME DRIVE SURVEY # 1 PUMP RATE 200 GPM
START TIME 12:57 END TIME 13:19
UPPER GR 3346 LOWER GR 3356

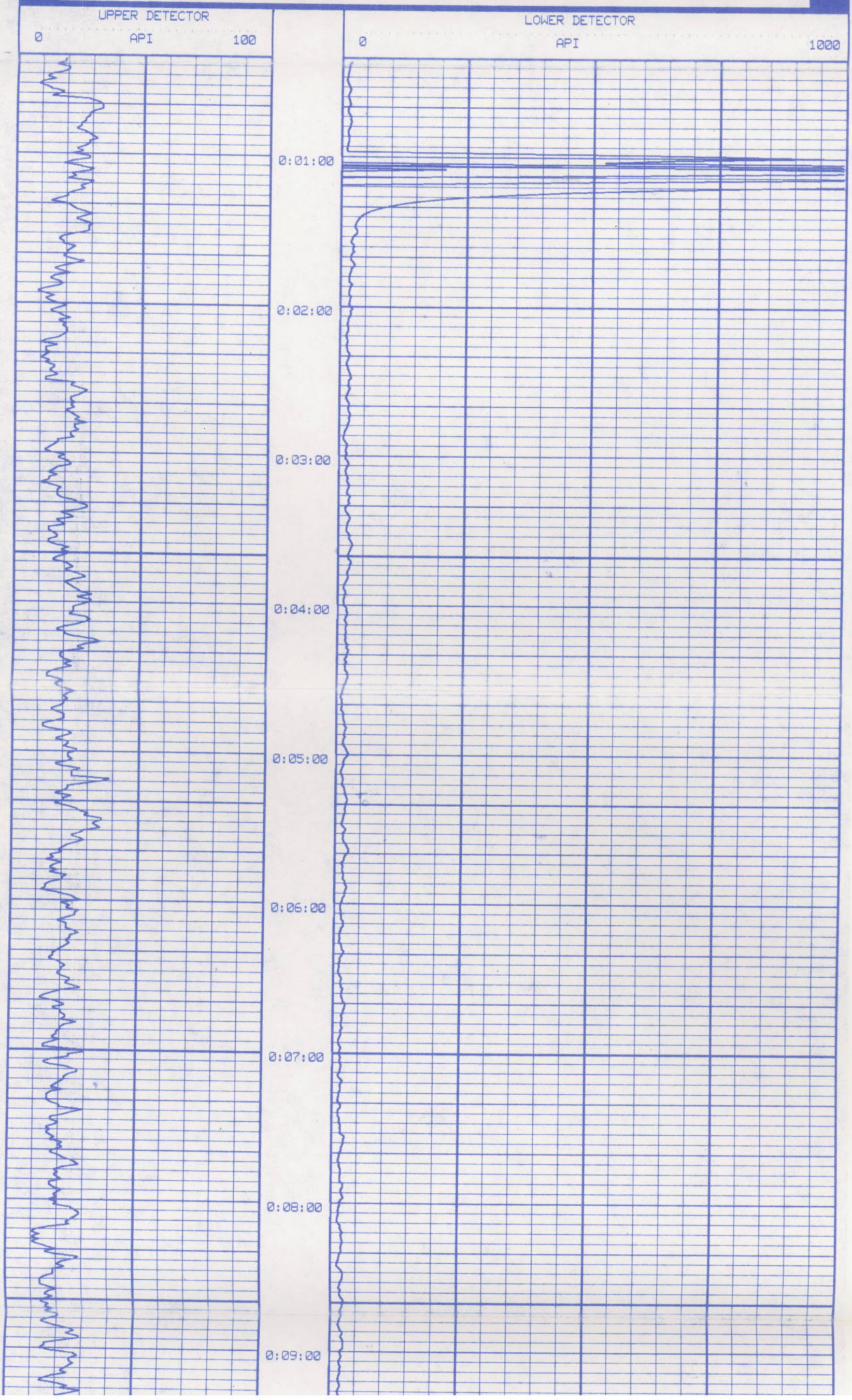
STOP DEPTH 660FT DATE: 000 01-2 TIME: 3-97 1 FILE: TIME PLAYBACK PROGRAM

START DEPTH 0FT DATE: 000 01-2 TIME: 3-97 1 FILE: TIME PLAYBACK PROGRAM

TIME DRIVE SURVEY # 2 PUMP RATE 200 GPM
START TIME 13:20 END TIME 13:42
UPPER GR 3346 LOWER GR 3356

UPPER DETECTOR LOWER DETECTOR

UPPER GR 3346 LOWER GR 3356



0:09:00

0:10:00

0:11:00

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0:13:00

0:14:00

0:15:00

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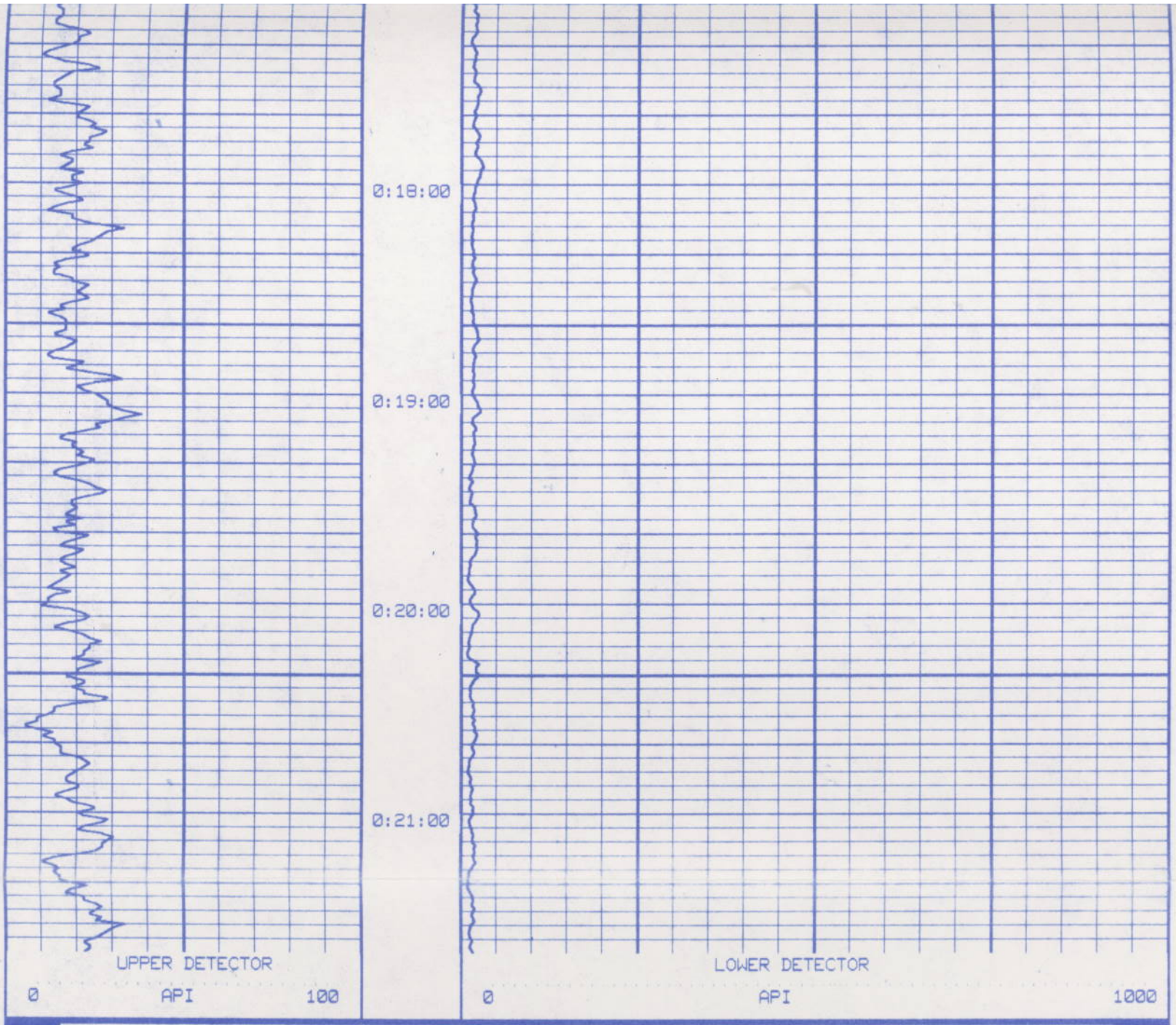
0:18:00



TIME DRIVE SURVEY # 2 PUMP RATE 200 GPM

START TIME 13:20 END TIME 13:42

UPPER GR 3346 LOWER GR 3356

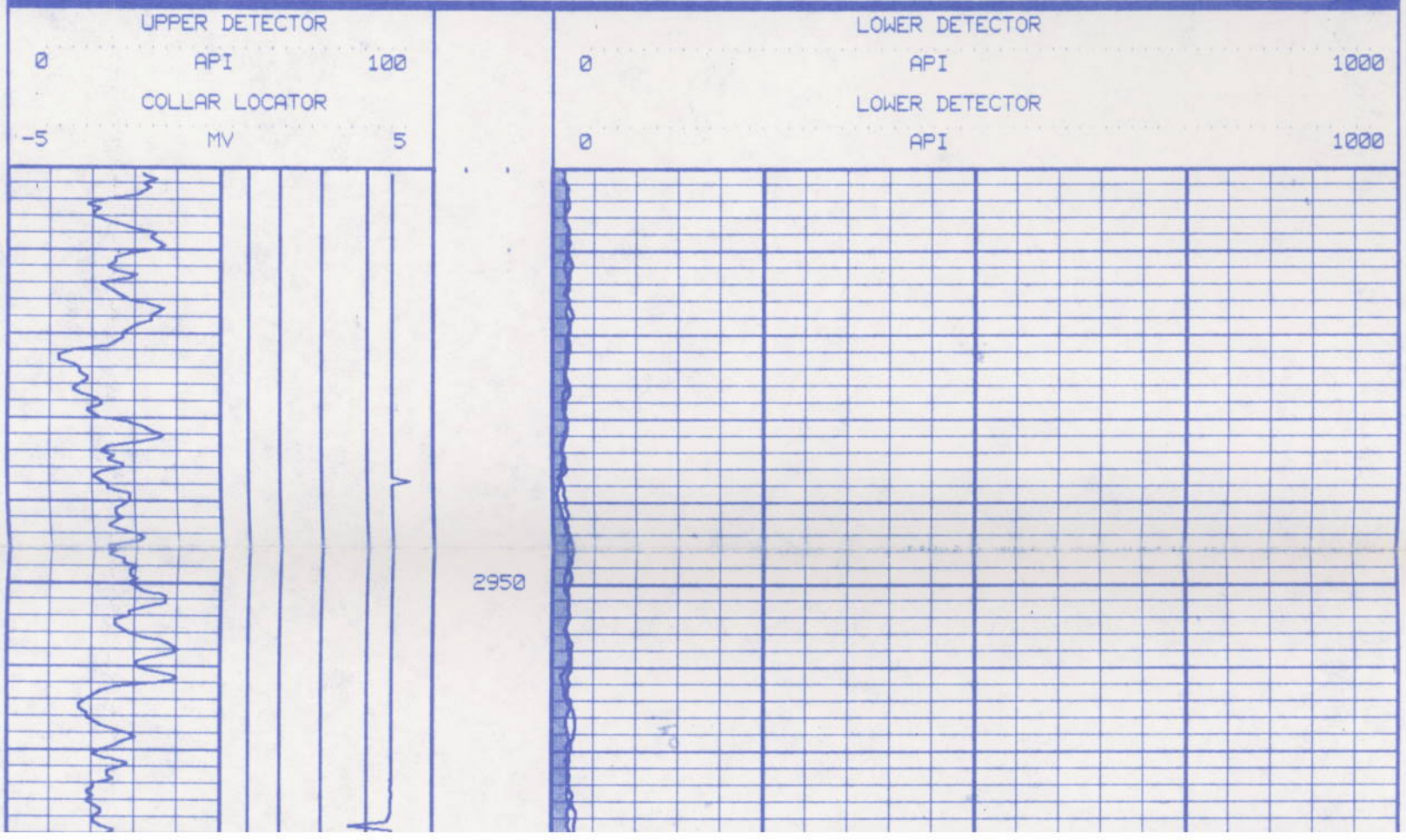
STOP DEPTH 640FT DATE: 000 01-2 TIME: 3-97 1 FILE: TIME PLAYBACK PROGRAM

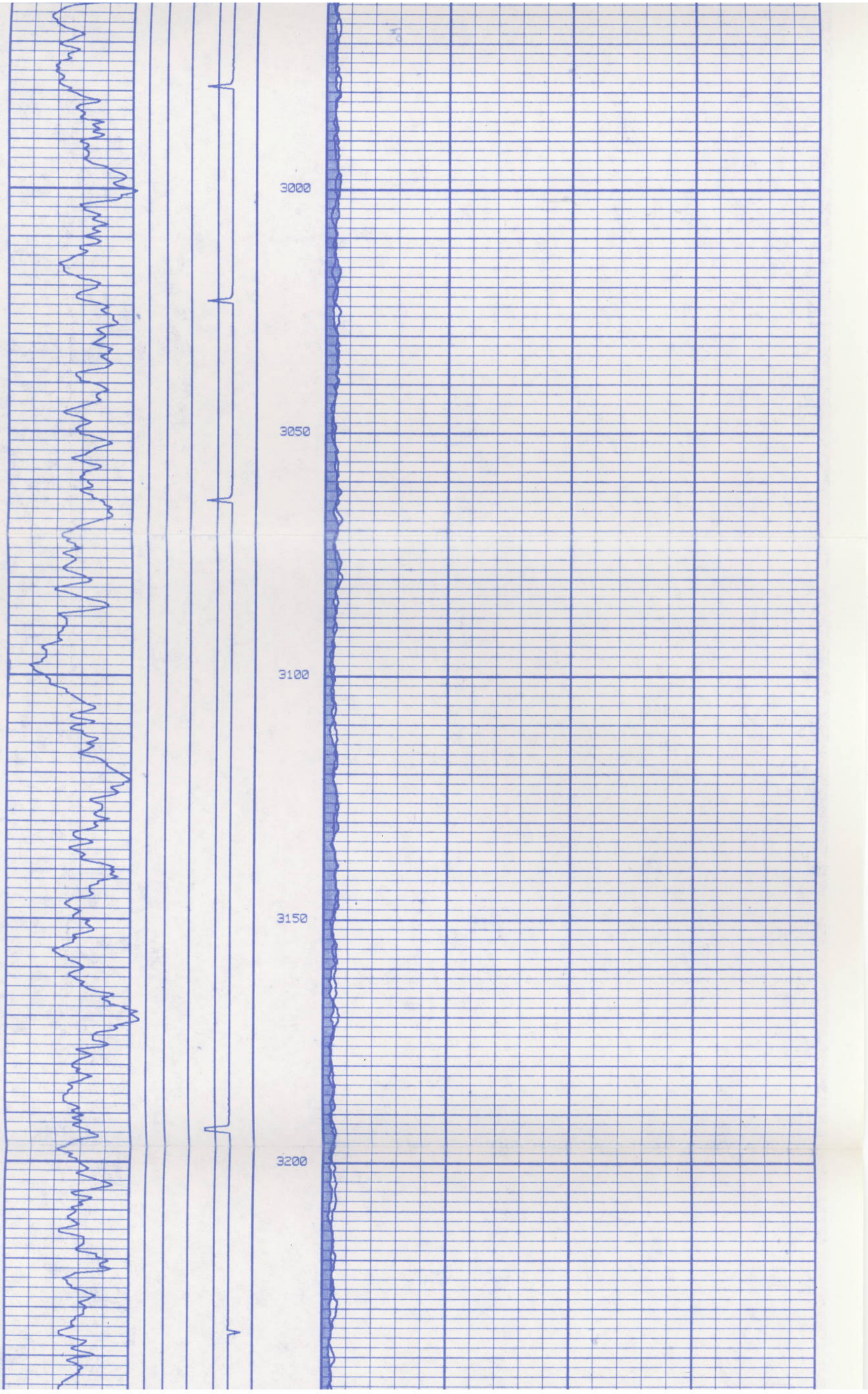
START DEPTH 2900FT DATE: 724 01-2 TIME: 7-97 5 FILE: BASE2 PLAYBACK PROGRAM

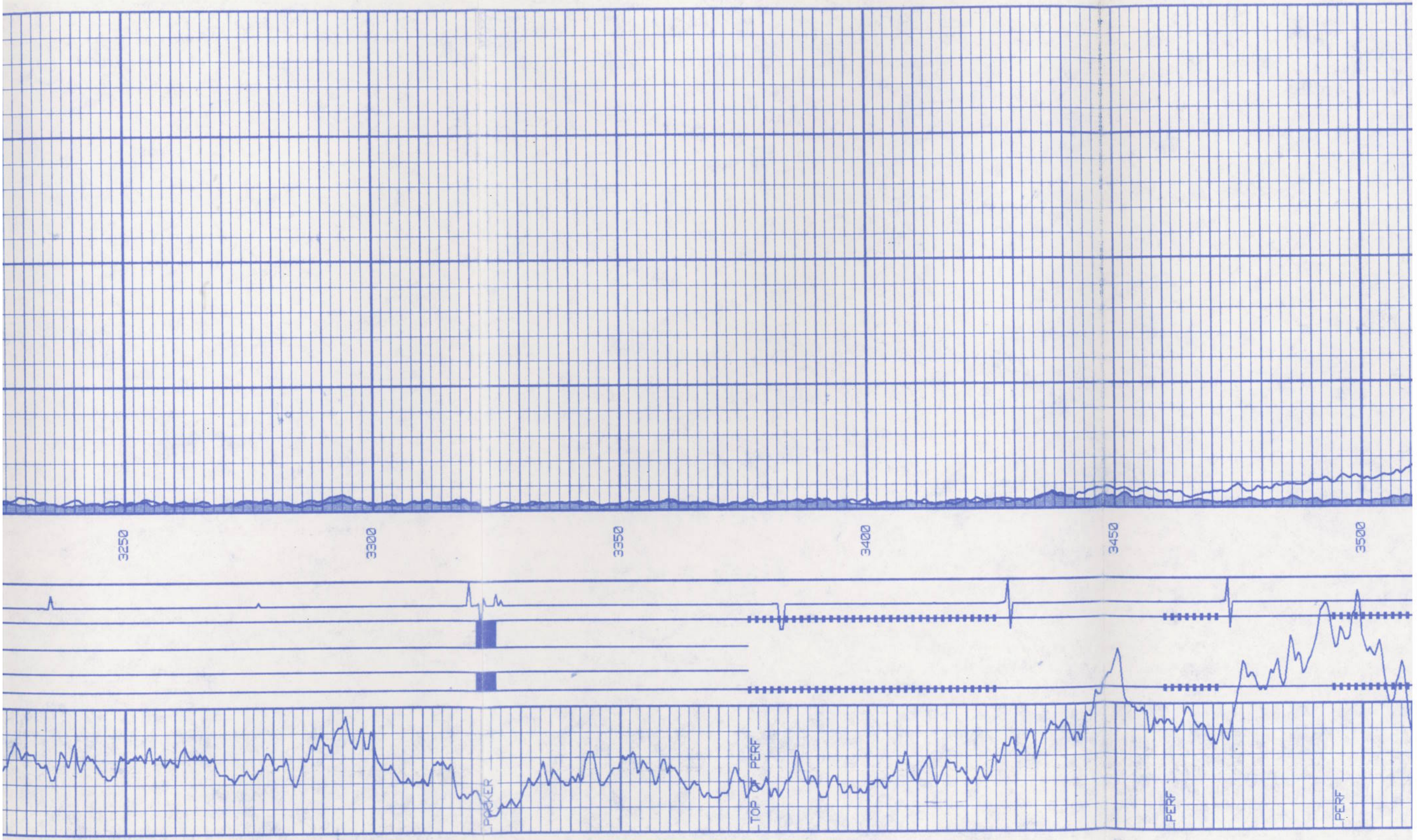
BASE LOG AFTER SURVEY WITH OVERLAY PUMP RATE 0 GPM

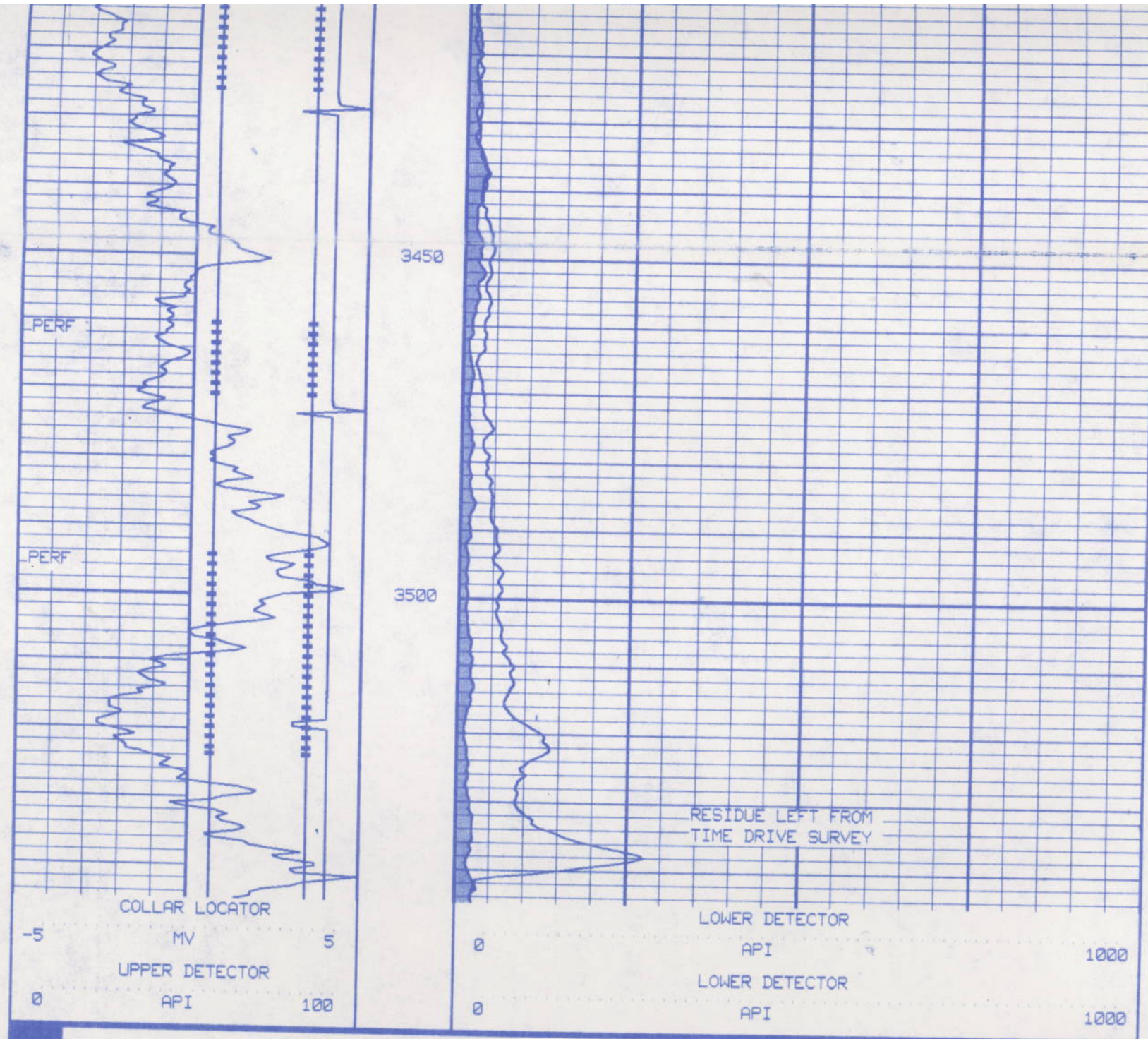
START TIME 13:48 END TIME 14:03

DEPTH LOGGED 3545-2900 BEFORE BASE IS SHADED




3000
3050
3100
3150
3200


3250
3300
3350
3400
3450
3500
PACKER
TOP PERF
PERF
PERF



BASE LOG AFTER SURVEY WITH OVERLAY PUMP RATE 0 GPM

START TIME 13:48 END TIME 14:03

DEPTH LOGGED 3545-2900 BEFORE BASE IS SHADED

STOP DEPTH 3545FT DATE: 724 01-2 TIME: 7-97 5 FILE: BASE2 PLAYBACK PROGRAM